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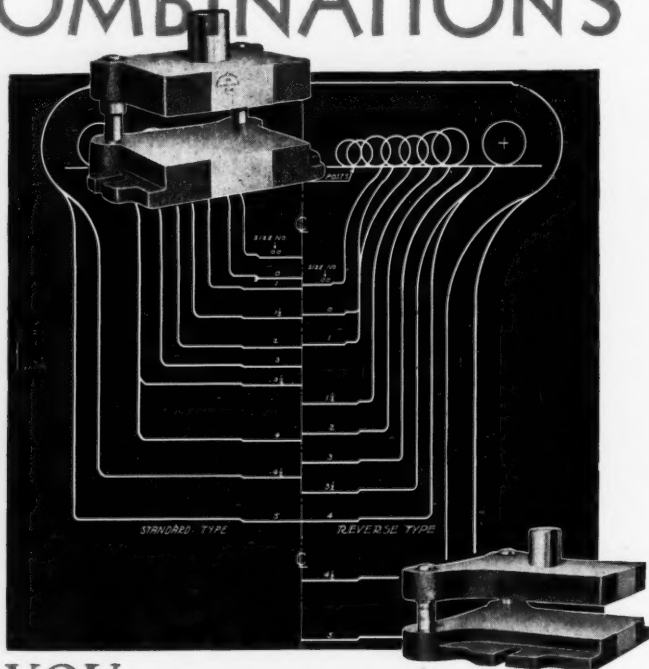
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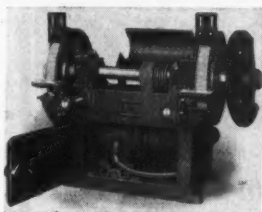


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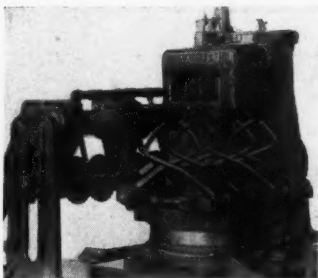
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Before the automobile few people but the wealthy, and those fortunate enough to live within the borders of our natural playgrounds, could enjoy their scenic wonders and healthful recreation. Today they beckon to all and ere this month is past the truck will have started to the Deerkin, the Wolf, the Bruie, and numerous other cold water streams where trout abound. . . . Even though many other economic changes have been brought about by the automobile, the great recreational advantage stands out as an achievement of those manufacturers who, through continuous scrutiny of production methods and costs, have placed motor cars within the reach of hundreds of thousands of families.

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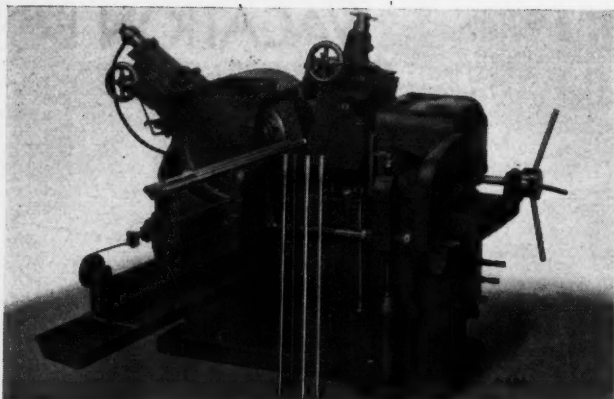
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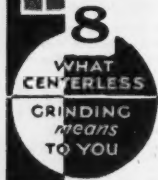
ANOTHER new job has been adapted to the Centerless Grinder —finishing tapered metallic or non-metallic work, as for example golf club shafts.

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This is the eighth of a series of advertisements to tell you the advantages of the Centerless Grinder. Watch for those to follow.

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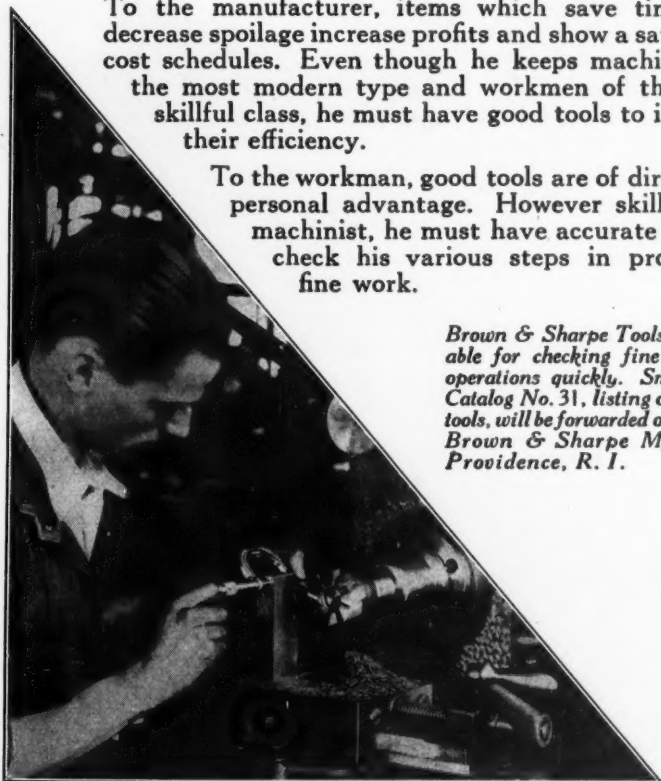
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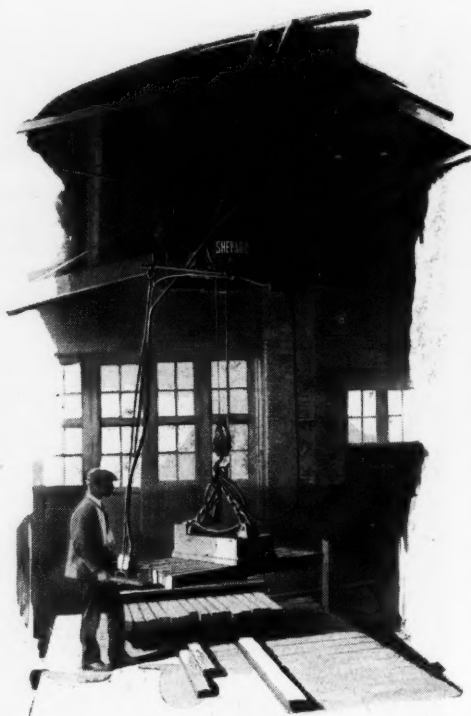
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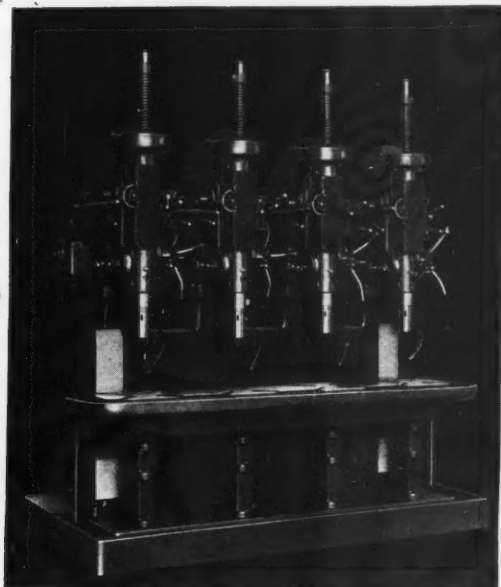
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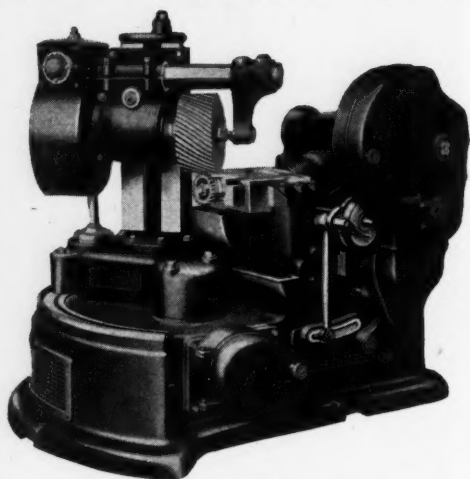
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MODERN Machine Shop

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A Magazine for Machine Shop Executives

HOWARD CAMPBELL, Editor

Vol. 3

JUNE, 1930

No. 1

CONTENTS

	<i>Page</i>
RECLAMATION OF RAILWAY CAR PARTS BY WELDING.....	11
<i>By Jas. M. Vossler</i>	
CONSTRUCTION OF BOEING AIRPLANES.....	16
<i>By Robert Johnson</i>	
THE REDUCTION OF FATIGUE BY EFFICIENT SEATING.....	30
<i>By Donald A. Clark</i>	
MODERN TOOLING PRACTICE, III.....	40
<i>By Frank W. Curtis</i>	
WHAT ABOUT GUIDE POSTS FOR DIE SETS?.....	56
<i>By Paul A. Bard</i>	
IDEAS FROM READERS.....	62
—FORMING RINGS ON THE MILLING MACHINE, <i>By Charles Kugler</i>	
—PREVENTING BREAKAGE OF EXPANDING REAMERS, <i>By R. H. Kasper</i>	
—TOOL FOR MACHINING GREASE GROOVES IN DRIVING BOX CROWN BRASSES, <i>By J. H. Hahn</i>	
—A TWO-DIE SET AUTOMATIC EJECTING-CENTERING JOB, <i>By C. G. Crowley</i>	
OVER THE EDITOR'S DESK.....	70
NEW SHOP EQUIPMENT.....	72
FOR YOUR CATALOG LIBRARY.....	104
"THE SCRAP PILE".....	112
INDEX TO ADVERTISEMENTS.....	114

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Corinth, Mississippi

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MODERN Machine Shop

CINCINNATI, OHIO

JUNE, 1930

VOL. 3, No. 1

Reclamation of Railway Car Parts by Welding

By JAS. M. VOSSLER

Welding Instructor, Southern Pacific Lines, Houston, Texas

IN past years the replacement of worn or broken parts of railway cars has been a very costly proposition. Everything possible has been done to reclaim such parts, but the extent to which this salvaging process could be carried on has been very limited, due to the inefficiency of bolt and rivet methods. When, for instance, a body bolster was cracked, it was repaired by riveting on a large, heavy plate. Other parts were reclaimed by similar means.

Repairing parts that are subject to heavy vibration by bolting or riveting patch plates or shapes over the cracks is all too often merely a temporary job. The rivets or bolts will soon work loose and thus the value of the patch is lost, necessitating either the reaming of the holes and the replacement of the rivets or bolts, or replacement of a new part.

It has only been since the advent of autogenous welding that much could be accomplished in car department reclamation work, or that positively permanent repairs to cracked

or broken car parts could be made. The results of the first experiments with welding were so poor that it was doubtful whether the process was going to prove a success or not. Enthusiastic and overly anxious to take full advantage of the new process, those in charge were inclined to regard the welding torch as a gen-

eral "cure-all" and attempts were made to weld parts which later experience has shown were doomed to failure from the start. Other parts that could have been welded by proper methods of procedure failed due to lack of sufficient knowledge of the process, and altogether the failures were so frequent that many

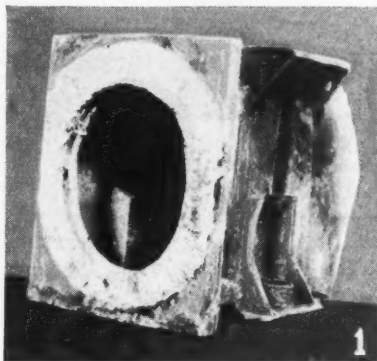


Fig. 1—Journal box on which the dust guard plate has been built up by welding.

condemned the process and would have little or nothing more to do with it.

Often, however, it is through failure that we learn. Those who had confidence in the process and the determination to discover its secrets have developed it until, today, it is probably the most important factor in the work of reclamation. The

higher carbon and alloy steels, and most of the non-ferrous metals and their alloys.

In making an analysis of the statement made in the previous paragraph, the effect produced in cast iron by electric arc welding should be considered. When the arc is established between the piece of cast iron and the electrode, that portion

of the iron that is exposed to the direct heat of the arc melts almost instantaneously. Additional metal is deposited from the electrode upon the molten cast iron. As the arc passes on, the molten metal and the adjacent metal, which has also been heated to a point above the hardening temperature, will be chilled by the comparatively cold surrounding metal and will become extremely hard and brittle. The consequence is that

strains are set up in the weld and the adjacent metal. The only conclusion that can be drawn from this result is that the electric arc is generally not suitable for welding cast iron parts.

Another type of job for which the electric arc has been found unsuitable consists in the welding of cracked or broken steel castings containing blow holes or sand pockets. When a casting is known to contain blow holes or sand pockets, it is best always to use the oxy-acetylene process. When the electric arc is used, the metal starts depositing practically as soon as the arc is established, and the sand and other

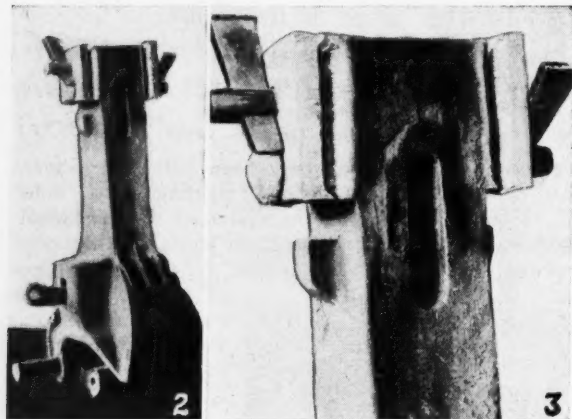


Fig. 2—An old-style coupler that is to be repaired to conform to the size of the new style couplers. Fig. 3—The shank with plates clamped in place for welding on.

savings that can be made through adequate knowledge of the process and proper handling of the work are practically unlimited.

After it has been decided whether or not there is any feature of the job that would bar either of the processes, the first question to arise, usually, is whether the electric arc or the acetylene torch is best for the particular job in hand. With certain exceptions, the best results are obtained with the electric arc only on wrought iron and low carbon steels, while the oxy-acetylene torch can be used successfully, not only on wrought iron and low carbon steels, but also on cast iron, most of the

impurities are covered over. The result is poor fusion and a brittle weld. The use of the oxy-acetylene torch, on the other hand, makes it possible for the welder to melt to the bottom of the blow holes or sand pockets and float the slag off before the new metal is deposited.

In attempting a division of the

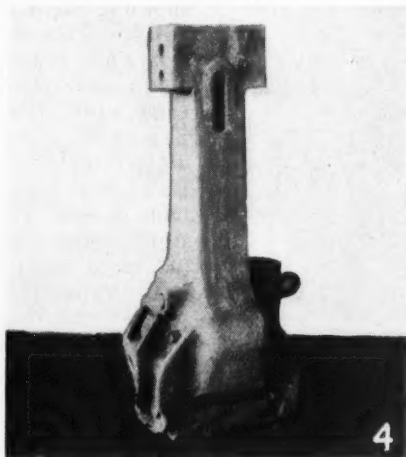


Fig. 4—The finished coupler.

work between the two processes, wrought iron, rolled or forged low carbon steels and low carbon steel castings that are reasonably free from blowholes and impurities should be considered as possibilities for the electric arc, due to the economy of the arc and lessened danger of warpage. The use of the arc on medium carbon steel, however, is limited, and with high carbon and alloy steels the practicability of the arc is so limited as to be negligible. The use of the arc on non-ferrous metals is limited to a few places where bronze is deposited for resisting abrasion, and for welding cast iron with nickel alloy rods.

Practically any part of a car can

be welded with the oxy-acetylene torch, and the portability of the acetylene welding outfit makes it popular for car-shop work. Cast steel parts that are known to contain blow holes or sand, all medium and high carbon steels, and all cast iron parts should be welded by this process.

Malleable iron is not easily welded by either process, but by applying Tobin bronze with the oxy-acetylene torch, practically any broken malleable iron casting can be repaired. Although a cast iron filler rod is usually used in the welding of cast iron, in many cases it will be found that a quick, economical, and equally strong weld can be made with Tobin bronze. Tobin bronze is best for building up worn places on either malleable or cast iron unless the rate of wear on the worn piece is very rapid. In the latter case, a Manganese bronze filler rod should be used, as the ability of Manganese bronze to resist abrasion is much greater.

In applying bronze to either steel, malleable iron, or cast iron, the part should be preheated to a temperature of between 550 and 600 degrees F. The preheating will lessen the possibility of warpage, lessen the tendency toward burning the bronze, and effect a saving in oxygen and acetylene gases, in addition to effecting a saving in time. Large castings should be preheated to eliminate the danger of cracking.

When cast iron is to be welded with a cast iron filler rod, it should always be preheated to a dark cherry red before starting the weld. The preheat minimizes the possibility of cracking, aids in securing a better grade of deposited metal in the weld, prevents the parent metal at the edge of the weld from becoming

hardened, and helps to effect a saving in welding gases. Unfortunately, however, preheating is all too often neglected. In many cases where a piece of cast iron has broken at the edge of a weld in a piece that was not preheated, the statement has been made that the failure was no fault of the method by which the weld was made. On the contrary, the failure can be charged directly against the method of welding, due to the fact that the cold metal adjacent to the weld chilled the iron at the edge of the weld and hardened it. This hardening action set up strains that caused the failure.

The welding of car parts must be done in accordance with the "Code of Rules for Interchange of Traffic" of the American Railway Association. Rule No. 23 on page 53 of the issue of the above code which became effective January 1, 1930, is very definite in its description of the parts on which welding or building up of worn surfaces will be permitted. The provisions of the above-mentioned code may at first seem to be exacting, but when the proposition is carefully considered and each item is checked as to safety and durability, it will be seen that the rules are very reasonable and necessary.

The rule requiring annealing after welding is very important. Failure to observe this rule will plunge the

welder into difficulties. The annealing operation removes any strains that have been set up in the welding operation, and all large castings and forgings, whether they are mentioned in the list referred to above or not, should be annealed for this reason.

The illustrations show several car parts in process of welding. The piece shown in Fig. 1 is a journal box on which the dust guard plate was badly worn. The piece is shown after the worn part has been built up with Tobin bronze. An old style 6½-in. butt Type "D" coupler that has been prepared for welding is shown in Fig. 2, and Fig. 3 shows the shank at close range. The new style couplers have 9½-in. butts,

and in the latter illustration the method of building up the coupler is shown. Plates of the necessary thickness are clamped in position and are then made an integral part of the casting by welding. Figure 4 shows the finished coupler and a close-up view of the shank is again shown, after the welding operation has been completed, in Fig. 5. The shank is now of the required thickness.

By mentioning MODERN MACHINE SHOP when writing to the firms who are advertising in this issue, you are helping to build up a bigger and better magazine for your own benefit.

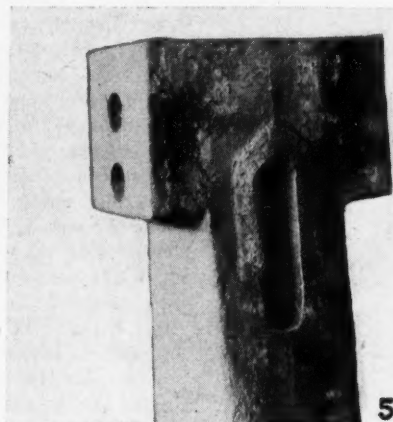


Fig. 5—The completed shank. This shank is now of the same thickness as the new style couplers.

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Boeing Airplane Company

THE largest plant in the United States devoted exclusively to the manufacture of airplanes is that of the Boeing Airplane Company, located at Seattle, Washington. This plant consists of twelve buildings with a combined floor area of 300,000 square feet, and additions are now under way which will increase this space by 25 per cent. Founded twelve years ago to build military planes, the original company of thirty people has grown to an organization employing 1,400 workmen, practically every one of whom is a skilled mechanic.

With the steadily increasing use of metal in aircraft manufacture, there has been a proportionate increase in the importance of the metal shops of the Boeing plant. The metal-working unit, which includes the machine shop, welding and brazing department,

sheet metal department and heat treat room is the largest single section of the plant. The machine shop is the keystone of this unit, approximately 50 per cent of the actual manufacturing work being done in this modern, well-equipped department. The lathe and shaper departments, located at one end of the shop, are shown in Fig. 2.

The illustration Fig. 3 shows a 700-ton hydraulic press in which the sheet metal surfaces for the empennage, stabilizers, rudders, fins and elevators, gas tanks, cowlings and other sheet metal parts that require shaping or pressing are processed. The platen, which is 129 in. x 60 in., is driven against the top head of the press by hydraulic power, forming the metal between the dies. Dies of hard maple, surfaced with wax, are used

(Continued on page 20)

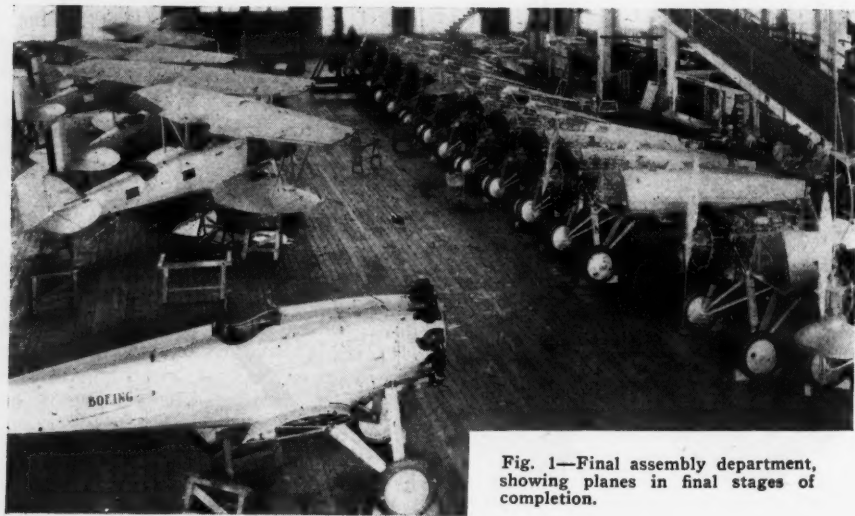


Fig. 1—Final assembly department, showing planes in final stages of completion.

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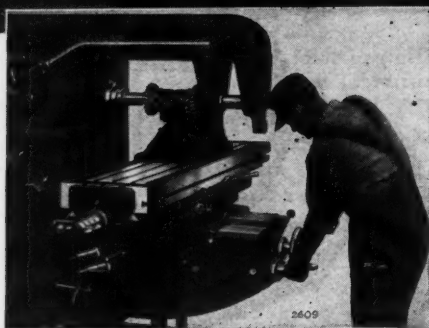
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The operator is raising the knee with the hand adjusting crank. Note the large micrometer dial.



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Toolroom and manufacturing shops alike, demand milling machines with a new accuracy and a new convenience. Where else but on the new No. 3 and No. 4 Cincinnati Millers can you find this combination of accuracy and convenience?

The Cincinnati Milling Machine Co.

CINCINNATI, OHIO, U. S. A.



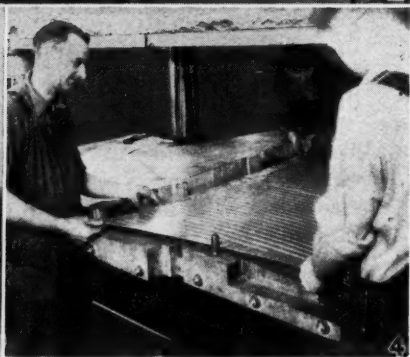
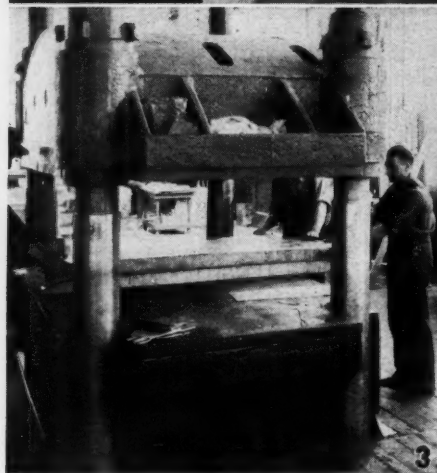
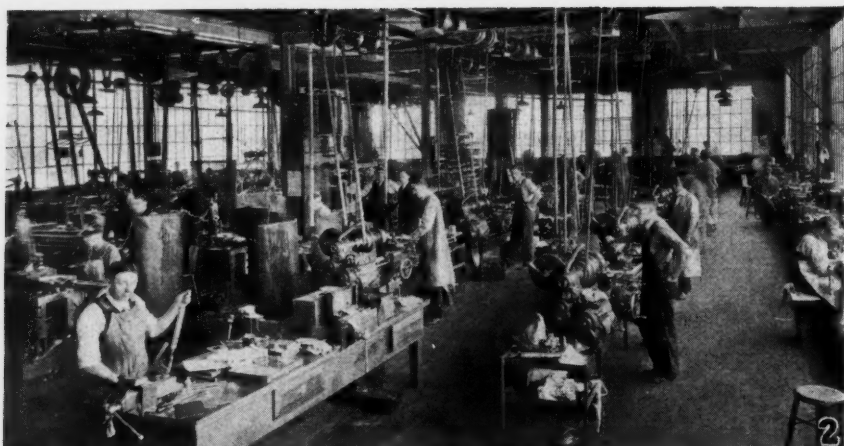


Fig. 2—General view of machine shop. Fig. 3—700-ton hydraulic press for shaping sheet metal parts. Fig. 4—Removing stabilizer cover from press after forming.

Boeing Airplanes

(Continued from page 16)

for processing sheets of aluminum, dural, alclad, brass, copper, or steel, the wood being reinforced with metal when the sheets are unusually heavy, and special cast steel dies being used for pressing the heavier sheet steel parts. The illustration Fig. 4 shows the workmen removing a stabilizer cover from the press after forming. The corrugations which are formed in

the metal increase the strength of the surface and the stream-lines lessen the resistance to air.

After the aluminum alloy parts, such as stabilizer covers, cowling, and similar parts have been formed to shape and size, they are given a heat treatment which hardens and toughens them. The treatment consists of dipping the parts in a solution of equal parts of potassium and sodium nitrate which is kept at a temperature of between 940 and 950

Where Speed and Accuracy are considered

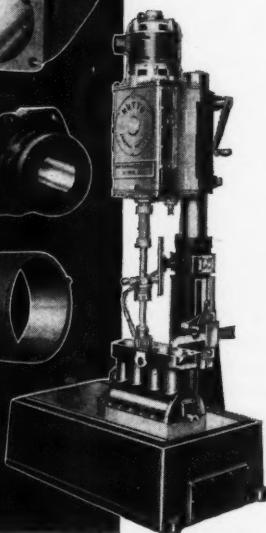
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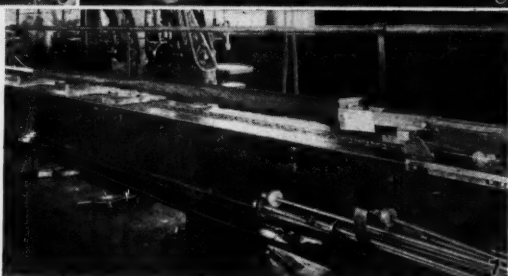
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Fig. 5—Aluminum alloy parts are heat treated in a tank of potassium and sodium nitrate solution. Fig. 6—One of the electric furnaces in which steel parts are heat treated. Fig. 7—Drawing a length of $3\frac{1}{2}$ -in. tubing to form a stream-line section 1.66 x 4.97 inches.



degrees F., the length of time required for the treatment depending upon the thickness of the material. The thinnest metal used, which is .0179 in. thick, requires a treatment of nine minutes while a part .2043 in. thick—the thickest—requires twenty-eight minutes of treatment to obtain the necessary result. One of the three solution tanks is shown in Fig. 5. Included with each lot of material that is immersed in the tank for treatment is a strip of metal cut from the same stock as the parts to which it is attached. At the conclusion of the operation, this strip is sent to the testing laboratories, where it is tested for strength. The test for dural, for instance, is 56,000 pounds per sq. in., which is approximately the same as the test for average carbon steel.

Such steel parts as are used in the construction of the Boeing plane are given hardening and toughening treatments in one of the three electric

furnaces with which this plant is equipped. Nickel and chrome molybdenum steel are the alloys chiefly used, entering into the manufacture of struts, landing gears, axles, tail-skids, and similar parts. The furnaces, one of which is shown in Fig. 6, are thermostatically-controlled and are equipped with automatic recording pyrometers, which chart the temperatures of the three furnaces at all times, thus providing a permanent record of the treatments.

All nickel steel parts are subjected to a maximum temperature of 1,500 degrees F., while molybdenum chrome steel is treated to a top heat of 1,625 degrees F. The length of time required for the treatment depends upon the thickness of the part, although the average treatment takes from one and one-half to two hours.

(Continued on page 26)

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13" Superspeed Ball Bearing Sensitive Drill Will Reduce Your Drill Breakage

Ball Bearings for every journal. Each bearing protected by dirt-proof metal oil retainers and properly mounted.

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Running Parts Balanced. Every revolving member is balanced so that all vibration at high speeds is eliminated, and drill breakage is reduced to a minimum.

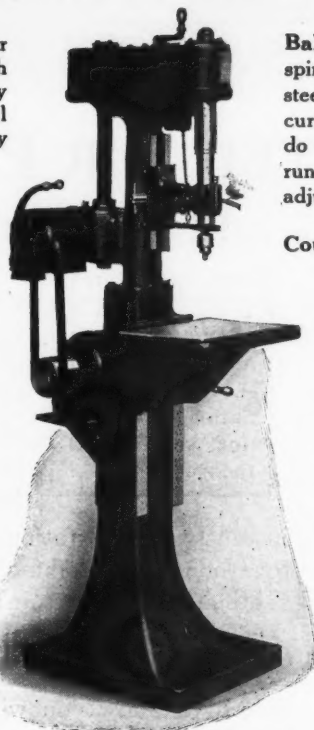
Speed Changes. The belt is shifted and speeds are changed by a single turn of the small handle on top. Belts can be replaced easily.

Adjustable Feed Lever. The feed lever is adjustable to various positions for convenience of operation. A quick return star wheel enables the operator to feed, return, or position the drill rapidly with either hand.

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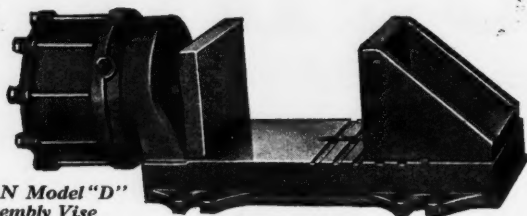


Balanced Spindle. The spindle is of high carbon steel, multiple splined, accurately ground, tested to do perfect alignment and running balance, and has adjustment to take up wear.

Counterbalanced Elevating Table. The elevating table is of the quick-acting counterbalanced type, with perfectly scraped slide gibbed to the pedestal. Handle at front of machine for clamping.

Counterbalanced Head. The head is gibbed to the dovetailed slide on the column, and is counterbalanced to prevent dropping when unclamped.

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the Flat"
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FOR DRILLS,

TAPS, REAMERS, END MILLS, KEYWAY CUTTERS, ETC.

Boeing Airplanes

(Continued from page 22)

One of the most interesting operations in the shop is the drawing of square, rectangular, and stream-line tubing and special channel sections by means of an especially-designed draw bench, shown in Fig. 7. The bench is 42 feet in length, the mechanism consisting mostly of a heavy endless chain which revolves around massive sprockets at either end of the bench. With this equipment the round tubing is drawn to the required shape, a previous annealing operation making the tubing soft and workable.

The illustration shows the draw bench in action, a length of tubing

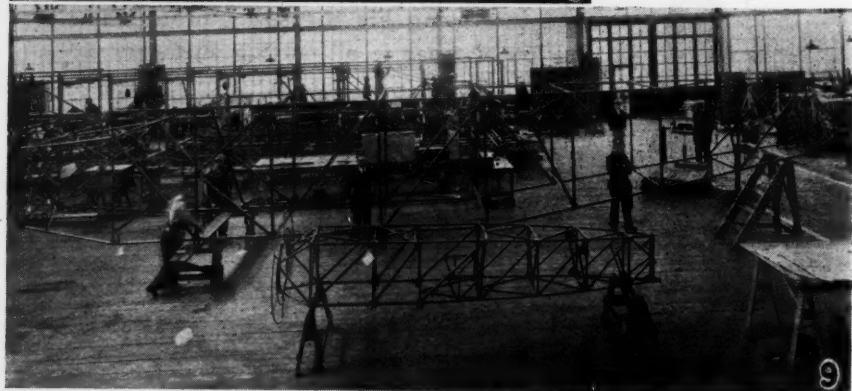
$3\frac{1}{2}$ inches in diameter with a wall of .083 inch being shown in process of being drawn into a streamline section 1.66×4.97 inches. This section, which is molybdenum steel alloy, will be used for supporting struts in the landing gear. The chain moves at a speed of 15 ft. per min., pulling the tubing over a die which forms it to the desired shape.

One of the greatest enemies of air travel is corrosion. The unusual conditions to which airplanes are exposed, coupled with the necessary thinness of the parts, has made the problem of shielding the exposed parts most important. After a great deal of experimenting, Boeing engineers

found that the most satisfactory protection for parts of ferrous metals could be obtained by plating the parts with cadmium. A test was made by coating one of the



Fig. 8 — Cadmium - plating tanks, showing some of the parts that have been plated. Fig. 9 — View in fuselage welding department. Electric welding is used largely on this work. Note $18\frac{1}{2}$ -ft. fuselage by side of 50-ft. transport plane fuselage.



THE SMALLEST, FASTEST, HANDIEST GRINDER

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EVERY machinist, every tool maker, every die maker—in fact, everybody who works with metal in irregular shapes—will want one of these new tools on his bench.

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It's a little, high speed grinder, not much bigger than your finger, only $7\frac{3}{4}$ inches long. It handles as easily as a fountain pen. But it travels at a mile-a-minute speed with a half-inch wheel. And it really grinds instead of just rubbing.

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It touches off tool steel as neatly, smoothly and rapidly as a big wheel grinder. It gets into the inaccessible places to blend radii. It does in minutes work that otherwise requires hours of stoning on parts that require touching-up after hardening. And all it needs is ordinary shop air-pressure. Specify Model AG for pressures 50 to 100 pounds. Specify Model AGL for pressures 20 to 50 pounds.

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Fig. 10—Welding structural tubing with electric welder.

parts with cadmium and subjecting it to a salt spray bath for 1,000 hours, at the end of which time no sign of corrosion could be discovered. As a result, every steel part entering into the construction of Boeing planes is cadmium-plated before use. A view of the department where this work is done is shown in Fig. 8.

A view of the fuselage welding department is shown in Fig. 9, where an 18½-foot single-seater pursuit plane fuselage can be seen by the side of the 50-foot fuselage of a transport plane. The parts for each fuselage are assembled together in a steel jig and are clamped in the exact position that they are intended to occupy. The welder anchors the parts in place with the welding torch, then removes the clamps and completes the job. The use of the steel jig insures the perfect alignment and accuracy of the parts.

An unusual feature of the fuselage assembly process in this plant is the use of electric welding. Tests have

shown that the maximum of strength and durability are obtained by the use of the electric welder, and this type of welding is employed in all structural assemblage. Boeing engineers have developed an AC electric welding machine that permits the successful welding of tubing ranging from .035 in. to .375 in. in thickness, and many of these welding sets are in constant use on this work. A welder is shown in Fig. 10 using an electric welding outfit on structural tubing.

After a fuselage has been completed, the engine base—or motor ring—is attached by welding to the front end of the framework, then the bosses in this ring are drilled for the bolts with which the motor is to be bolted on. To make sure that the surfaces of these bosses are smooth and parallel with each other, so as to

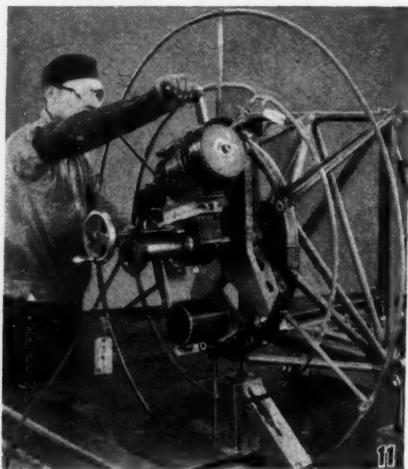


Fig. 11—Grinding bosses on motor ring to insure solid mounting for motor.

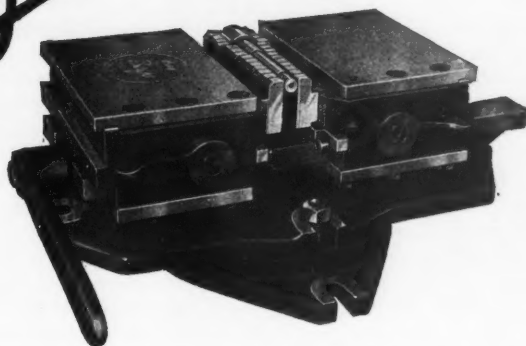
insure a perfectly solid mounting for the motor, an attachment which carries a small grinder is clamped to

(Continued on page 103)

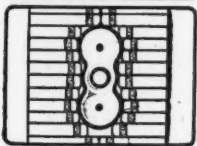
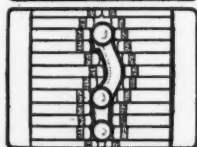
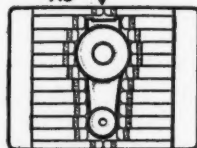
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THE BERJO Vise holds any shape . . . no matter how irregular . . . with a giant-like grip. Its compensating jaws . . . built on a new principle . . . automatically conform to the contour of the piece, exerting an even pressure on both sides of the work.

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The Reduction of Fatigue by Efficient Seating

By DONALD A. CLARK

IN this highly competitive age, the manufacturer is most successful who is able to obtain a maximum of production at a minimum of cost. The extent to which these objectives are gained is dependent upon two factors—mechanical and human. The mechanical factor embraces the items of equipment, tools, materials, accessibility of these materials, and so on. All other factors being at the highest point of efficiency, the amount of production possible in a given length of time is controlled by the ability of the worker, modified by the extent to which his efficiency

is lowered by failure of his human machine—a condition which is known as fatigue.

If it were possible to eliminate fatigue, obviously the workman could turn out work with the regularity of a machine and maintain his pace continuously from the start to the end of the working period. A time study of any operation in which the human element is an important factor will show, however, that production is reduced from 30 to 70 per cent below its possibilities, due to fatigue alone.

To what extent this factor of fatigue can be controlled is a matter



Properly-designed chairs in use in a large plant where small parts are manufactured

They said "IT COULDN'T BE DONE"

... but these new "Perfec-Hole" wheels by SAFETY are as accurately machined as the adapters themselves

A GAIN SAFETY has done "the thing that couldn't be done." This time it is the development of a new process, upon which patents are pending, and by means of which large-hole grinding wheels are fitted with lead centers *guaranteed* accurate to a slip fit. This lead center is firmly imbedded in the abrasive, yet is not over $1/32$ " thick at any point.

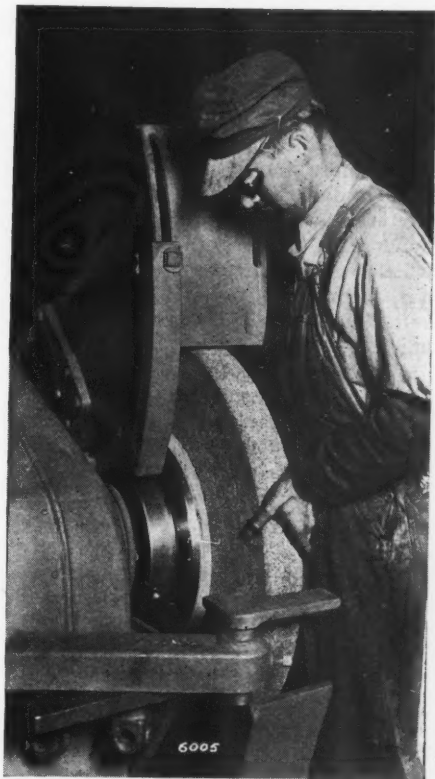
Thus is removed, once and for all, the old nuisance and expense of trying to mount wheels that did not fit the adapters—that were either so snug that they set up an initial strain in the wheel and sometimes caused breakage in forcing them on, or else were so loose that they had to be shimmed, which made the wheel unbalanced.

We believe this is one of the most important grinding-wheel developments in recent years. Users agree—and are enthusiastic in their comments. You will be, too, when you find out what a difference these wheels make. The cost is the same as standard list. The advantage is just another item of *extra* value by SAFETY.

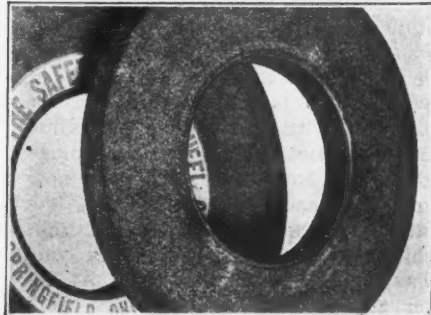
Investigate *today*, for your own satisfaction—and your own profit.

The Safety Grinding Wheel & Machine Co.

2364 Columbus Ave., Springfield, O.



The new SAFETY "Perfec-Hole" Wheels slip on to the adapters snugly, but without forcing. They are GUARANTEED accurate to a slip fit.



for speculation. It is significant that employers of today welcome the development of equipment which will make the worker's task easier, not necessarily as a matter of generosity, but as a matter of good business. The modern daylight factory which provides many times the light that was available through the windows of the more ancient factory buildings rewards its users with increased production and better workmanship. The application of power to perform tasks which were formerly done by hand has, in practically every instance, resulted in vastly increased production and lower costs.

Many other improvements have been made in working conditions, including the arrangement of the work, wherever possible, so that the workers can be seated while working. Unfortunately, however, there are still a large number of employers who have not been able to see that the simple matter of providing seats for the workers is not enough; seats should also be comfortable and should perform a definite service by helping to eliminate fatigue.

It hasn't been so many years since the idea prevailed that anyone who tried to work while sitting down was lazy. Even in our automobile factories, which today lead the world in manufacturing efficiency, the worker of twenty years ago was forced to stand at every task where standing was possible, and workers were prevented from sitting down to rest even when such intermittent rests did not interfere with the work. Of course the machinists did manage to smuggle small boxes into the shop now and then and hide them under the lathes or behind the milling machines, but woe to the person who was caught sitting on one. At intervals, of course, the boxes were

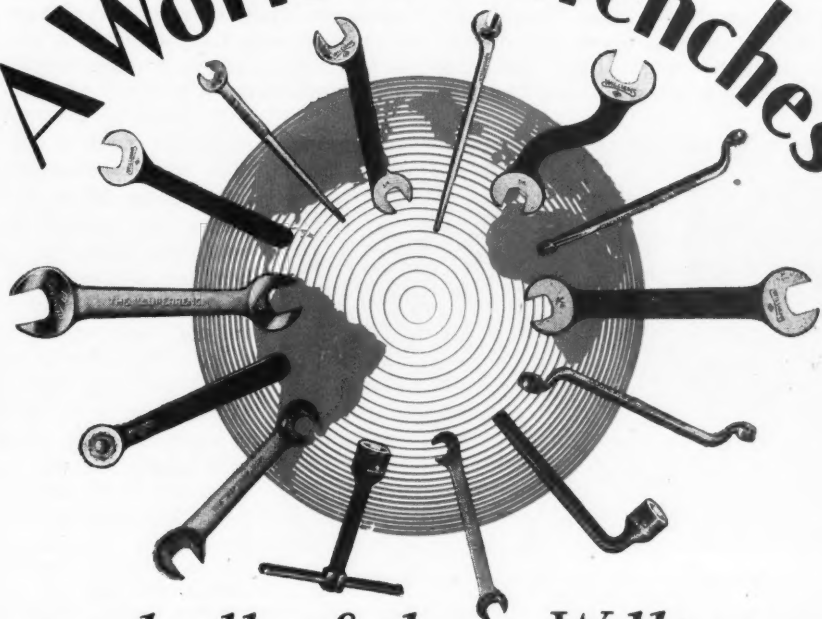
gathered up by the sweeper and thrown out.

With the change in sentiment toward the worker and the introduction of motion study, the use of seats of one kind or another was inaugurated. However, there were still whole departments of girl workers in one of our largest electrical manufacturing plants who were standing up to work at the task of winding condenser coils—by hand—as late as 1914. In that year a machine was developed by which the coils could be wound by machine, and the girls were provided with seats so that they could sit down at their work.

The first seats applied to factory use were stools, and probably the majority of manufacturing plants are still using these stools. Eventually the executives in these plants will discover that properly-designed seats will pay for themselves in increased production, but there is no reason why these same executives should not learn this lesson now.

To begin with, a properly-designed seat for a worker who sits down at the job is as important as properly-designed tools. The idea that anything in the shape of a seat is good enough, or that all seats should be of the same height, is entirely wrong. Chairs should be adjustable to the height of the workers. It is very important that each seat should be located at a height which will allow the feet of the user to rest on the floor or other solid support. When the worker's feet are not properly supported, he cannot control his movements easily and an unnecessary amount of effort must be put forth to effect movements which involve reaching, pounding, pushing, and so on. Also, unless the legs are perfectly supported by the feet, the weight of the legs themselves pulls

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them down onto the front edge of the seat, thus compressing the veins and arteries and interfering with the circulation of the blood. This condition results in discomfort and fatigue, which the worker tries to alleviate by moving about and changing positions frequently. The seat should be low enough or the foot rest

The back support is an important part of the seat—almost as important as the seat itself. It is well known that the human body resists fatigue longest when it is properly balanced. That is why soldiers are trained to hold themselves in a perfectly erect position, whether standing or marching. The erect position,

with the body straight from the neck to the hips, conserves energy by avoiding the expenditure of energy to hold the body in a bent or slanting position, which is unnatural and, therefore, tiresome. There is no strain on a rod that is standing in a perfectly perpendicular position; slant the rod at an angle of 45 degrees from the perpendicular, or bend it so that it forms a curve, and a strain will be set up

throughout its entire length. This is also true of the body. The worker who is forced to lean over at the task will tire much quicker than one whose work is arranged so that he can sit perfectly straight.

The back of a chair is intended to afford a certain amount of support, but a back that is straight, or which slants backward, affords very little support for the person whose hands are engaged in work. The extension of the arms in front of the body develops a weight which must, in order to maintain the equilibrium, be counterbalanced. This counterbalance can be effected by supporting the back between the pelvic bones and the ribs, thus providing support for that part of the body which has the



Modern-type chairs in use in a radio factory.

should be high enough so that the knees will be elevated slightly above the seat, thus avoiding the condition referred to.

The area of the seat should be sufficient to afford adequate support for the person using it. A seat that is so small that the body of the user bulges over the sides—as is the case with most “stools”—is uncomfortable and tiring. Also, while a flat seat at the proper height and with an efficient back rest will do very nicely, a seat which has been shaped so that the pelvic seat bones rest in depressions which have been shaped to sustain the pelvis in its proper relation to the spine is much more comfortable and is worth any added expense. Such a seat is known as a “saddle-seat.”

(Continued on page 38)

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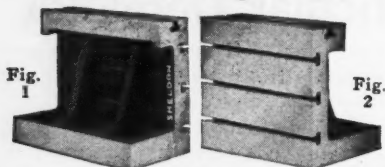
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Catalog of any of above Machines upon request.

Sheldon 90° Angle Plates

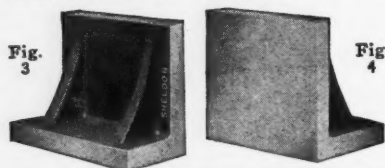


These Plates are made of semi-steel, heavily ribbed, insuring close-grained, rigid castings.

With Second Face and T Slots

No.	Size Face	Size Top	Size Base	T Slots	Wt., Lbs.	Price, Each
1T	3 3/4 x 5	1 1/2 x 5	2 1/2 x 5	4-1/4"	5	\$10.00
2T	6 x 7	2 1/2 x 7	4 1/2 x 7	4-1/2"	20	15.00
3T	8 x 9	3 x 9	6 x 9	4-1/2"	38	20.00
4T	10 x 12	3 1/2 x 12	7 1/4 x 12	4-5/8"	75	30.00
5T	14 x 16	4 x 16	9 x 16	4-5/8"	170	45.00

SHELDON 90° PLAIN ANGLE PLATES



No.	Size Face	Thickness Face	Size Base	Wt., Lbs.	Price, Each
1P	3 3/4 x 5	1/2	2 1/2 x 5	4	\$ 8.00
2P	6 x 7	3/4	4 1/2 x 7	15	10.00
3P	8 x 9	1	6 x 9	30	14.00
4P	10 x 12	1 1/4	7 3/4 x 12	60	20.00
5P	14 x 16	1 1/2	9 x 16	145	30.00

Sheldon "Set-Up" Jacks



PLANER JACKS (Fig. 1)

No.	Height, Contracted	Height, Extended	Diam., Screw	Weight, Lbs.	Price, Each
1	2 3/4	3 3/4	7/8	1 1/2	\$1.25
2	3 3/4	5 1/4	1 1/8	3	2.10
3	5 1/4	7 1/2	1 1/4	6	3.00
4	7 1/4	12	1 1/2	12	6.00

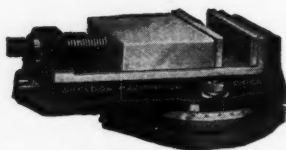
VERTICAL JACKS (Fig. 2)

No.	Height, Contracted	Height, Extended	Diam., Screw	Weight, Lbs.	Price, Each
1	2 3/4	4	5/8	1 1/2	\$.75
2	4	7 1/2	5/8	2	1.10
3	6 3/4	12	3/4	5 1/2	1.70
4	8 3/4	15	1	7	2.50

BRACING JACKS (Fig. 3)

No.	Height, Contracted	Height, Extended	Diam., Screw	Weight, Lbs.	Price, Each
1	3 3/4	6	5/8	1	\$.65
2	4 3/4	8	5/8	2	1.00
3	6 3/4	12	3/4	3	1.50
4	8 3/4	16	3/4	4	2.10

Sheldon Milling Machine Vises

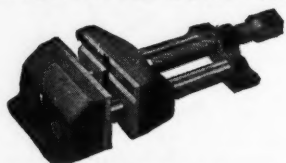


Furnished Both Plain and With Swivel Base.

SPECIFICATIONS AND PRICES:

No.	Width of Jaws	Depth of Jaws	Jaws Open	PLAIN VISE		SWIVEL VISE	
				Wt., lbs.	Price	Wt., lbs.	Price
3	3 1/2"	1 3/8"	2 1/4"	15	\$16.00	25	\$20.00
4	4 1/2"	1 3/8"	3 3/4"	30	\$20.00	45	\$24.00
6	6 1/2"	2"	4 1/2"	70	\$30.00	90	\$40.00
8	8 1/2"	2 1/2"	7"	160	\$45.00	225	\$60.00

Sheldon Drill Press Vises

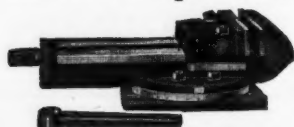


Guide Bars are Hardened and Ground.

SPECIFICATIONS AND PRICES:

No.	Width of Jaws	Depth of Jaws over Guide Bars	Full Depth of Jaws	Jaws Open	Wt., lbs.	Price
D 4	4 1/2"	1 3/8"	3"	4"	15	\$12.00
D 6	6 1/2"	1 3/8"	3 3/4"	6"	35	\$18.00
D 9	9"	2 1/2"	4 1/2"	9"	70	\$24.00

Sheldon Shaper Vises



SPECIFICATIONS AND PRICES:

No.	Size of Jaws	Vise Opens	Bolt Hole Spacing*	Wt., lbs.	Price
1	12" x 2 1/2"	12 1/2"	7 1/4"	175	\$120.00
2	14" x 2 1/2"	13 1/2"	8 1/4"	240	\$135.00

*Distance between holes can be changed without additional charge.

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SHELDON MACHINE TOOL CO.

3251 Cottage Grove Avenue, CHICAGO, ILL.

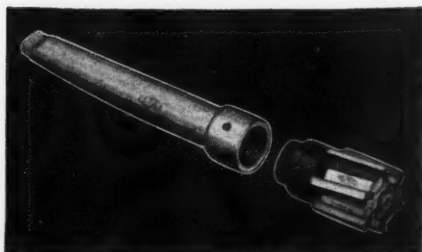


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Reduction of Fatigue

(Continued from page 34)

least natural support and making it possible for the body to curve backward in a natural manner.

The back rest should be constructed so that it cannot touch the body below the "small" of the back; the hips must be allowed to extend back past the vertical center line of the back rest, to balance the shoulders. The ordinary type of chair with the straight back interferes with the hips and thus prevents support being provided for the back at the point where it is most needed—between the thigh bones and the ribs. In order to obtain this support, the worker will, when tired, bend the back so as to bring this part of the back into contact with the back of the chair, thus throwing the upper part of the body forward, in an unnatural position.

The back rest should be adjustable for height, so that the seat can be adapted for use by a person of any height or build, and should be constructed so as to fit into the curve of the back. Sharp corners or edges should be avoided on this part of the seat, also. Best results are obtained if the back rest can be adjusted to fit the needs of the individual user, as the curve in the spine varies with the person. Some backs are very nearly straight, while in others the curve is more pronounced. Particularly is this true of female workers, and usually the back that curves the most is the one which is most in need of adequate support. Obviously, therefore, a back rest which would serve perfectly for one person would be entirely inadequate for another.

The provision of properly-designed

seats for workers who are required to maintain one position throughout the day is not merely a matter of accommodation to the employees; it is a responsibility which is entitled to serious consideration by every employer. Improper seating facilities may be responsible not only for excessive fatigue—with resultant loss of production—but they may be charged with a variety of detrimental effects ranging from a hampering of the natural bodily functions to curvature of the spine (permanent round shoulders), indigestion, weak lungs, hemorrhoids, and pelvic disorders. At the very least, the strain of working in an unnatural and uncomfortable position lowers the vitality and frequently tends to undermine the health of the individual.

The responsibility for the health and happiness of those who form his working organization is being assumed more and more by the modern employer, but the subject that has been discussed here is one that has been overlooked by many otherwise progressive executives. It is possible that some will see in the adoption of better seating facilities only an added expense. The extent to which this idea is a fallacy can be very easily determined by equipping a department, or section of a department, with chairs which have been properly designed and noting the results.

Not only will the executive who follows out this suggestion find that this slightly increased expense is compensated for by an increase in the comfort and therefore the morale of the workers, but the actual increase in production will, in most cases, repay this expense many times over.

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"NATCO Solves Your 'Hole' Problem"

**THE NATIONAL AUTOMATIC TOOL CO.
RICHMOND, INDIANA, U. S. A.**

Modern Tooling Practice, III

By FRANK W. CURTIS

IN many cases, where the work-piece is of circular shape, some form of V-block is necessary for locating and clamping purposes. A number of V-blocks for miscellaneous

possible to machine a relief at the bottom of the V-cut, in which case a block of the type shown at **B** is recommended.

In many cases a designer will specify hardened and ground locating surfaces on V-blocks, but this practice is not recommended. If accurate work is to be located, it will be found far better to lap the two locating surfaces.

In machining the block, an allowance should be made for the alteration that is caused by the lapping operation. If the angular locating faces are ground, there will only be a line contact which will soon wear beyond maximum limits. The lapped surface will give a more serviceable bearing and, naturally, will

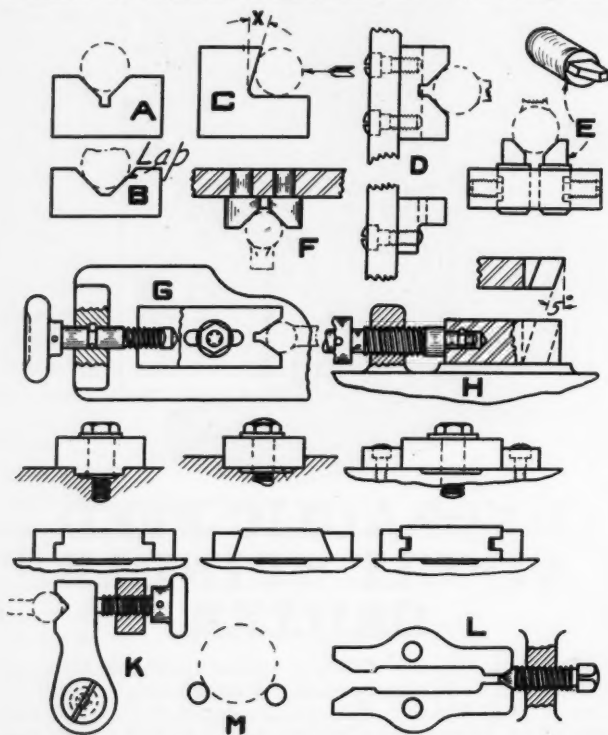


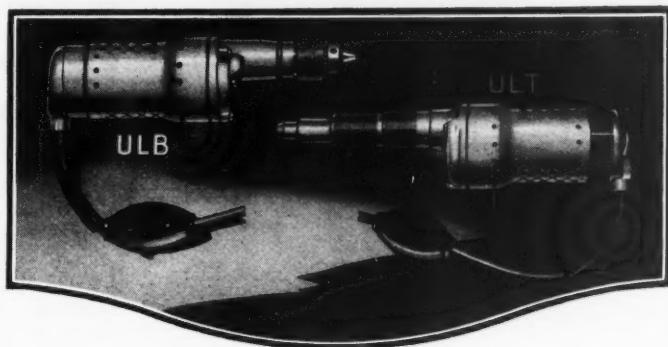
Fig. 16—Types of V-Blocks for Locating and Clamping Purposes.

uses, of a variety of designs are illustrated in Fig. 16. The V-block at **A** is of conventional form and is used somewhat universally for tooling purposes. Sometimes the height of the block is such that it is im-

possible to machine a relief at the bottom of the V-cut, in which case a block of the type shown at **B** is recommended. In many cases a designer will specify hardened and ground locating surfaces on V-blocks, but this practice is not recommended. If accurate work is to be located, it will be found far better to lap the two locating surfaces. In machining the block, an allowance should be made for the alteration that is caused by the lapping operation. If the angular locating faces are ground, there will only be a line contact which will soon wear beyond maximum limits. The lapped surface will give a more serviceable bearing and, naturally, will last much longer. The V-block shown at **C** is often used when horizontal pressure is to be applied. The angle **X** is usually made from 10 to 20 degrees, depending upon the nature of the work. Another form of

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**MIDGET TYPE — LIGHT IN WEIGHT
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THESE small electric drills and screw drivers were especially designed for fast, delicate work. Since their introduction, they have rapidly taken the place of small hand operated tools because of their practicability and the many different kinds of work they can be used on.

They fit into the palm of the hand, and being light, are very easily handled. Ideal for Aeroplane, Automobile, Radio, Furniture, Machinery and Electric Appliance manufacturers.

The drills are made in two sizes—

$\frac{1}{8}$ and $\frac{1}{4}$ in. capacity. Weight is 2 $\frac{3}{4}$ lbs. Length overall is 9 $\frac{1}{4}$ in.

The screw drivers are made in three types; one at 1,250 R.P.M. for No. 8-32 metal screws; one at 950 R.P.M. for No. 10-24 metal screws; and one at 485 R.P.M. for No. 8 Wood Screws. Weight is 3 lbs. Length overall is 11 $\frac{1}{4}$ in.

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V-block often used for locating purposes is shown at D. This unit is mounted to the side of a jig or fixture body and provides a satisfactory location, inasmuch as there is slight

A clamping V-block is shown at G. The block itself slides, the sliding action being controlled by a screw and hand knob. In this case the screw remains in a permanent position, whereas in the example indicated as H, the screw feeds in and out and the swivel pin is mounted in the V-block itself.

V-blocks of this design can be altered in a great many ways, and the examples shown, indicate some of the variations that are possible. At K is shown a hinged-type V-block which is often used in connection with the location of small round surfaces. A double-hinged type V-block is shown at L, a pointed set-screw, in this case permitting an equalizing motion of both blocks.

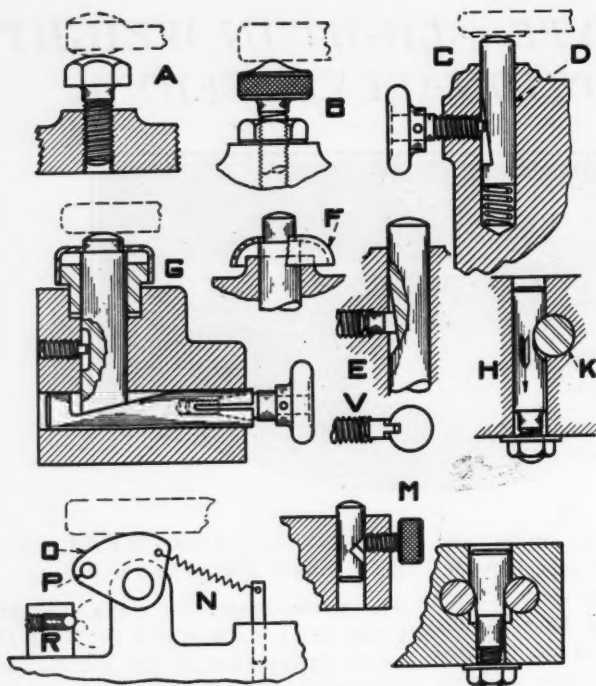


Fig. 17—Examples of Spring Jacks and Plungers.

possibility of dirt and chips lodging between the work and the locating surfaces. The V-block shown at E is made of two pins having angular contacting surfaces as shown. The advantage of this design is that the location of the work can be altered slightly if necessary, as in cases where the workpiece is a rough forging upon which the dimensions vary with various batches. The same principle is shown at F, although one adjustment is provided in this case.

Another method of locating round work includes the use of two pins such as those shown at M, but such a design is only for light work, and where extreme accuracy is not essential.

Jacks and Plungers

Screw jacks and spring plungers are used rather broadly in connection with the design of jigs and fixtures and find a rather prominent place in locating work having extended or projected surfaces that

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have slight variations. There are many types and kinds of jacks and plungers available for tooling purposes, the design selected for a given piece of work and operation depending largely upon the production required and the nature of the fixture that is to be used.

A number of examples from which to select a suitable jack or plunger are shown in Fig. 17. Perhaps the

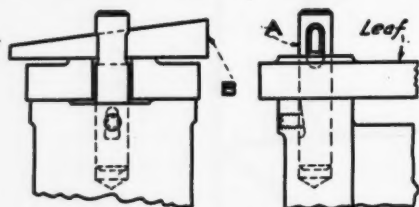


Fig. 18—Wedge Pin Type of Jig Leaf Lock.

simplest form of jack is an ordinary cap screw of the type shown at A, which is adjusted to suit the height of the work. A variation of this design is shown at B, in which the jack is provided with a knurled head for adjusting purposes.

A plain type of spring plunger is shown at C. The principle of all plungers is somewhat the same. The plunger pin D is made with an angular surface, which usually varies from 3 to 10 degrees according to the rise of the pin. The pin is locked in position by a screw that strikes the angular surface. A spring is used to hold the plunger pin against the work, so that when it is locked it will form a solid support. It is always better to provide a lock pin as an individual unit for locking purposes, because a rotating screw will tend to mushroom the angular face of the plunger pin. A soft metal, usually brass, will be found satisfactory. Still further, it is well to make

the lock pin as shown at E, thus preventing a rotating action. The pin in this case has a tongue that fits into a corresponding slot in the plunger pin. There is considerable chance for dirt or chips to interfere with the plunger pin unless steps are taken to prevent it, which should be done because the pin must have a free action. At F is shown a guard designed for this purpose. The use of a guard of this or similar design will make it difficult for dirt to hinder the proper operation of the plunger.

At G is shown another form of dust cap, this design consisting of an accurately machined cap that fits over the head of a bushing. Operation of the plunger in this case varies somewhat, in that the locking mechanism consists of a horizontal pin made with an angular face that bears against the bottom of the plunger pin. In operation, the locking pin is pushed forward until the plunger strikes the work, then the hand knob is turned, causing the taper to expand the collet end, thus causing a permanent binding action. To release the pressure, the hand knob is turned in the opposite direction and the locking pin is again free.

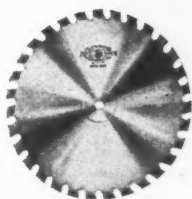
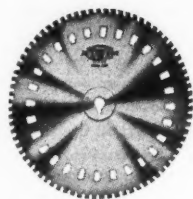
Another form of lock often used for spring plungers is that shown at H. In this case, the locking pin is made with a radial slot that fits around one side of the plunger pin K. The plunger pin is provided with a spring which seats the pin against the work, then when the locking pin is tightened, the circular relief binds against the plunger pin and holds it tightly in place. A modification of this design is shown at L, in which the locking pin is arranged to operate two plunger pins. Another sim-

(Continued on page 48)

Atkins Metal Cutting Saws

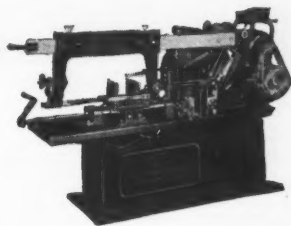
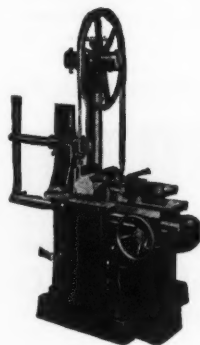


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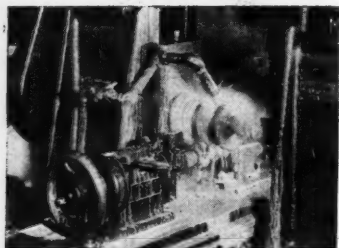


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MACHINE: CINCINNATI MILLER.
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WIDTH OF CUT: 2 INCHES
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SPEED: 75 R.P.M.
PRODUCTION: 30 PIECES PER HOUR
LUBRICANT: 1 PART SUNOCO TO 20 PARTS
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OFF CAP ON CONNECTING ROD
MACHINE: NEW 3-24 PLAIN CINCINNATI HY
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MILLS 17 IN. BY $\frac{1}{2}$ IN. SAW 1 SPECIAL ARBOR
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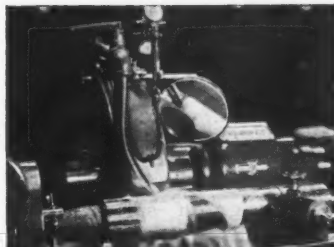
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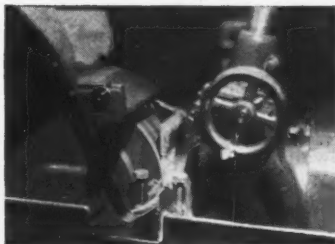
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OPERATION ROUGH AND SEMI-FINISH GRIND
ALL OVER ON GRINDING WHEEL SPINDLE
MACHINE: 14 IN. BY 48 IN. CINCINNATI PLAIN
SELF-CONTAINED GRINDER
MATERIAL: S A E 3145 HEAT TREATED STEEL.
STOCK REMOVAL: .030 INCH
LIMITS: PLUS .0005 INCH MINUS .0003 INCH.
GRINDING WHEEL: 30 IN. BY 3 IN. BY 20 IN.
40N27 ALOXITE.
TIME PER PIECE: 35 MINUTES.
LUBRICANT: 1 PART SUNOCO TO 40 PARTS
WATER

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PART NAME: PISTON PIN.
MACHINE: NO. 2 CINCINNATI CENTERLESS
GRINDER.
MATERIAL: HARDENED STEEL.
LIMITS: ROUND WITHIN .0005 INCH. STRAIGHT
WITHIN .0005 INCH. SIZE WITHIN .0001 INCH.
STOCK REMOVED: .001 INCH.
METHOD OF GRINDING: THRU-FEED.
PRODUCTION RATE: 28 PER MINUTE.
LUBRICANT: 1 PART SUNOCO TO 40 PARTS
WATER

Modern Tooling Practice

(Continued from page 44)

ple form of plunger, very often called a locating pin, is shown at M. In this design, the cone point of the screw strikes an angular face machined in the plunger pin, causing it to strike the work. In this position the pin cannot move downward, consequently a satisfactory lock is attained. This design is intended only for light work and will not be found satisfactory where excessive pressures are to be exerted.

A design of spring jack somewhat semi-automatic in operation is shown at N. The locating member O is made in the form of a cam having a rather slow dwell on the contacting face. The cam is adjusted under the work by means of a helical spring and, when once adjusted to the work, will not become loose unless the dwell of the cam is too steep. To release the cam, it is necessary to return it to a neutral position by means of a pin P, which engages the locking device R, consisting of a spring and ball. This device holds the cam out of the way during loading, but the cam can be easily brought into service by merely pushing the pin upward.

Jig Leaf Locks

Drill jigs are very often made with a leaf which is used either for clamp-

ing or for holding bushings. When jig leaves are used it is necessary to provide a suitable means of clamping them. Perhaps the simplest design is the wedge pin illustrated in Fig. 18. The leaf is made with a U-slot

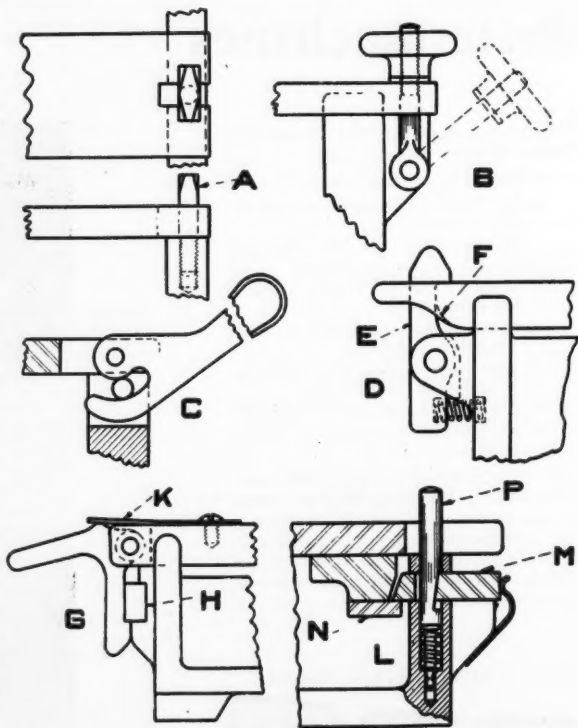


Fig. 19—Designs of Jig Leaf Locking Devices.

which fits over the pin A, and the pin is made with an elongated hole, as shown, so that the wedge B can be inserted. One side of the wedge is made with an angular face, so that a clamping action is obtained when the wedge is driven in. This means of locking a leaf will be found quite satisfactory for many types of jigs, although there are other forms that are more rapid in operation.

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"HYPRO"
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Planer

In Fig. 19 several forms of jig leaf locking devices are illustrated. At A is shown the conventional type of leaf bolt used in a majority of plants. The leaf is made with a slot slightly wider than the width of the bolt. In operation, the bolt is turned so that the leaf will pass over it when lowered, then the bolt is turned a quarter turn so that it seats against the upper face of the leaf. Another popular form of jig leaf lock is shown at B, this type consisting of an eyebolt and a hand knob. The knob is swung back out of the way as indicated by the dotted lines when the leaf is to be raised or lowered. The clamping action is obtained by adjusting the eyebolt in a vertical position, and then tightening the hand knob to suit. A leaf lock consisting of a cam latch is illustrated at C. In this design, the cam is carried with the leaf and is locked by swinging it in a downward direction, so that the slot machined in the latch engages the pin located on the jig body. The slot is curved to obtain a cam action, so that the leaf is held securely when the latch is swung downward.

Of the various forms of automatic leaf locks, the type shown at D is used rather extensively. The locking bar E is pivoted on the body of the jig and is provided with a spring so that it will remain in locking position. When the leaf is lowered, the surface F strikes the upper portion of the lock bar and forces it outward until the leaf is properly seated, then the lock bar automatically snaps into place, catching over the top face of the leaf. Another form of automatic lock is shown at G. In this case, the locking plate is carried with the leaf and the

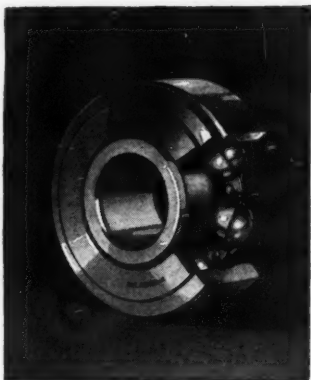
locking action is obtained by means of a hardened plate H that is made integral with the jig body. The leaf is provided with a flat spring K to hold the lock in the proper position. To release the leaf, it is only necessary to raise the handle, the action automatically releasing the lock and permitting the leaf to be thrown back out of the way.

Another self-locking leaf latch is illustrated at L. In this case, the body of the jig is provided with a plate M, which acts as the locking member. The leaf is provided with a locking plate N, which permits a satisfactory locking action to take place when the plate M fits over it. A flat spring bears against the rear end of the plate M, and holds it in the clamping position. To release the lock, it is only necessary to push down the pin P in which an angular face is machined to contact with a corresponding face on the block M, thus causing the block to recede. In this position the jig leaf is free to be raised.

Drill Jig Hinges

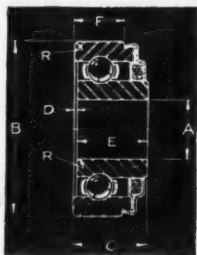
Drill jig hinges are made according to a variety of designs, several of which are shown in Fig. 20. At A is shown a plain type of hinge, made with two bearing surfaces in the leaf and one in the jig body. The pin, which in this design is straight, is made for a press fit in the jig body and a slip fit in the leaf bearings. Wear is quite likely to take place between the hinged joints and it is therefore advisable to supply washers as shown at B. Tapered pins are very often used for hinges and they will be found more economical than a straight pin, inasmuch as the compensation for wear is obtained by merely driving the pin

(Continued on page 54)



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fast to metal
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On this assembly the Edison Electric Appliance Company avoided four costly operations by using Self-tapping Screws instead of machine screws. Equally worthwhile advantages were gained by adopting these Screws for many of their other assemblies on ranges, baking ovens, stock kettles and water heaters.

If in the assembly of your product you join sheet metal or make fastenings to sheet metal, aluminum or die castings, Bakelite, slate, ebony asbestos, etc., do not fail to try these unique Screws. They offer a much

easier, speedier and cheaper way of making secure assemblies. It is only necessary to turn a Self-tapping Screw into a drilled or pierced hole . . . the Screw taps its own thread in the material.

Test Self-tapping Screws—see what they will do. Send a brief description of your assembly. We will furnish proper samples for a trial. They are made in two types: TYPE "A"—For joining and making fastenings to sheet metal up to 14 gauge (.078"). TYPE "Z"—For making fastenings to sheet metal up to 10 gauge (.040") and to die castings, Bakelite, ebony asbestos, slate, etc. PARKER - KALON CORPORATION
Dept. E, 192-196 Varick St., New York, N. Y.

PARKER-KALON
HARDENED SELF-TAPPING
Sheet Metal Screws

DETROIT 2401 E. 1000 - TEL. 1000000 - BUREAU 20 1000 - TEL. 1000000
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 "Questions to Ask Before Buying a Jig Borer."

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*You'll marvel at the accuracy with which it works.
 You'll revel in the fine Swiss workmanship.
 You'll be amazed at its speed in precision tool making.
 And you'll gladly pay the reasonable price for it,
 which the machine will return so quickly.
 And your associates will thank you for solving so
 many difficult shop problems.*

No wonder these Jig Borers were the sensation of the last four Steel Shows.

Every person interested in interchangeable parts, in tool making, inspection or development work, admired the ease with which it laid out, drilled and bored holes in jigs, fixtures, gages, dies, molds, templates—or in direct production of machine parts.

Its Vee and flat ways are beautifully scraped and have been checked by optical methods until they are straight within one second of arc.

Its spindles—one for heavy duty, one for high speeds—are so nicely centered that you can bore standard holes with end mills instead of adjustable boring tools.

Its measurements are made by micrometer leadscrews automatically compensated for their errors.

Its accessories widen its use and make it the most accurate measuring machine in the shop.

Over 200 in the United States—600 throughout the world.

Made by the Societe Genevoise, for 69 years makers of precision equipment.

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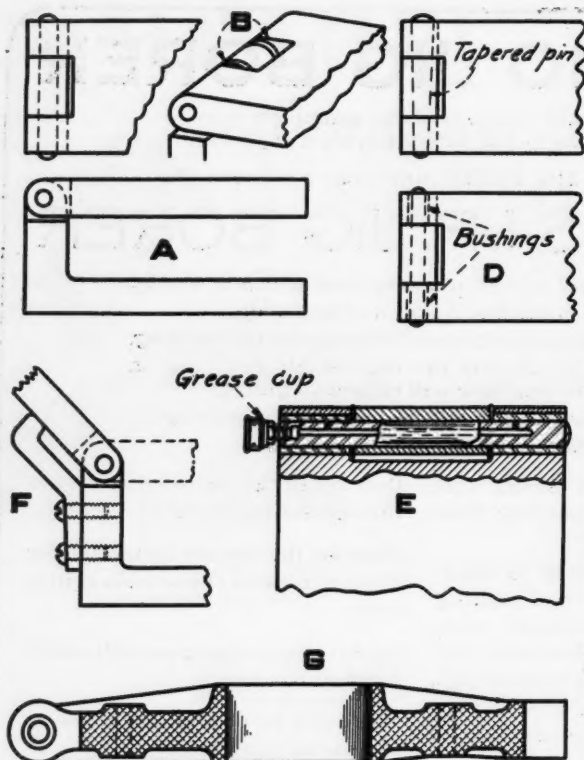


Fig. 20—Common Types of Drill Jig Hinges.

Modern Tooling Practice

(Continued from page 50)

slightly farther into the hinged assembly. It will be necessary, however, to ream the hole in the drill-jig body when this adjustment is made. Sometimes, to compensate for

wear, it is best to provide bushings in the leaf as shown at D.

Still further, it is sometimes advisable to provide a means of lubrication for the bearing surfaces. At E is shown a design embodying a hinged pin that holds a grease cup at one end and has oil holes drilled through the center so that both sections of the leaf can be lubricated. It is also advisable to provide a stop for a jig leaf. At F is shown a stop which consists of a bracket attached to the jig body. Large-type jigs are often made extremely accurate, making it necessary to provide an efficient form of hinged bearing as well as an adequate stop. Such a leaf is shown at G.

As will be seen, this jig leaf is of cast design and naturally involves more expense than the smaller types made of flat steel. For this reason precautions should be taken to see that there is no possible chance to break or injure the leaf.

Oil The Machine

No good mechanic would think of trying to operate a fine piece of machinery without first applying the proper amount of lubricating oil to the bearing surfaces; not enough oil to run out of the bearings and splash all over, but enough to enable the surfaces to operate in conjunction

without friction. Courtesy and diplomacy are the lubricants which will eliminate friction between departments and keep the plant running smoothly. Use enough oil.

By mentioning MODERN MACHINE SHOP when writing to the firms who are advertising in this issue, you are helping to build up a bigger and better magazine for your own benefit.



Rockwell Hardness Testing of a railway journal box

We often feel that the ingenuity of Rockwell users is the best proof that it has the confidence of those who are competent and skilled.

WILSON-MAEULEN **CO**
INCORPORATED

Concord Avenue and 143rd Street

New York

What About Guide Posts For Die Sets?

By PAUL A. BARD

TWO very able production executives recently had a considerable amount of discussion as to the advisability of using guide posts and bushings in their die sets. In the discussion a great deal of experience and information was brought out which should be worth passing along. It costs money to make and install guide posts and bushings. Is the cost justified?

Against guide posts and bushings are (1) first cost, (2) the added complications, (3) claims that guide posts get in the way and occupy valuable die space, so requiring the use of a larger die set, (4) they make it difficult for the operator to see the action of the die. The most important argument is based on costs and is usually summed up in the statement that while the cost of guide posts and bushings may be justified for a long run, it is not justified where the runs are short or the accuracy required is not great enough to justify guide posts and bushings.

The arguments in favor of guide posts and bushings are very much more numerous and are more readily stressed in terms of dollars and cents. The advantages of guide posts and bushings are as follows:

(a) Less time is required to mount the die.

(b) Less set-up time required to mount die sets on bolster plates in the press.

(c) Where guide posts and bushings are used all that is necessary is to place the die set upon the bolster plate, adjust the ram, lock up the

punch holder and then clamp down the die holder. Guide posts and bushings eliminate all problems of aligning punch and die holder, since the guide posts and bushings hold punch and die holder in their correct position.

(d) The saving in set-up time will range from 40 to 80 per cent due to the use of guide posts and bushings.

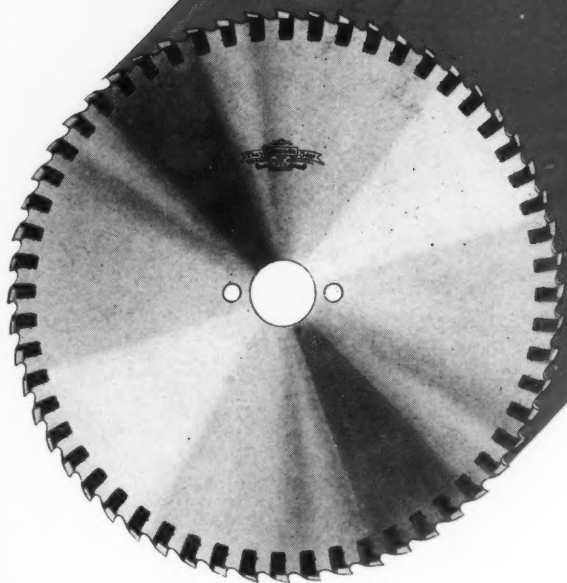
(e) Guide posts and bushings hold punch holder and die holder in perfect alignment at all times. The fit of punch in die is as accurate as the guide posts and bushings, a matter of a few ten-thousandths of an inch, whereas the play between ram and slide is a matter of hundredths of an inch. This becomes extremely important where presses have considerable play between ram and slide, since the guide posts and bushings enable these wobbly presses to be used with precision to produce accurate stampings.

(f) Shearing of dies is eliminated, where guide posts and bushings are used, since punch and die holder are held in perfect alignment at all times.

(g) The amount of grinding of dies is reduced, both as to the amount of grinding required per grind, that is, the "depth per grind," as well as the frequency. This, of course, means longer life for the die and increased production in a given time. Also more uniform schedules and a greater output per unit of time.

(h) "More pieces per grind" invariably follows the use of guide posts and bushings. In one case

(Continued on page 61)



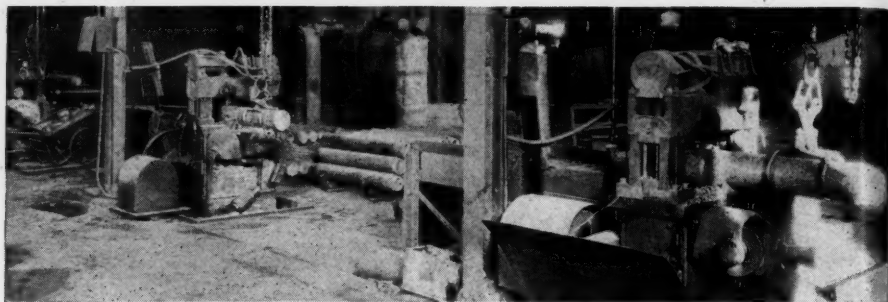
They Chose this 72 inch Saw to Cut Steel Billets in Japan

Cutting hard, tough steel in Japan is just as much a problem as in other parts of the world, and like most of the progressive metal working industries in this country, one of Japan's foremost steel makers solved it when they decided on the new Simonds Curved Gullet Inserted Tooth Metal Saw as the most logical for their work. Accordingly, after an investigation, a Simonds 72-inch Inserted Tooth Saw was ordered through Mitsui & Company, Limited, an internationally known firm with offices in New York.

To be sure the saw specified was 72 inches in diameter, a proved and standard type Simonds Inserted Tooth Saw with the curved gullets and teeth of Simonds own high speed steel, skillful workman-

ship and inbuilt quality. For some time this saw has been in operation in this Japanese plant, doing the hardest kind of cutting and standing up to its duty in the same honest manner that every Simonds Inserted Tooth Saw is doing wherever metal is cut with profit, dispatch and efficiency. Mitsui & Co. have advised Simonds Saw and Steel Co. of the pleasure it gives them in being able to supply such a very satisfactory saw to their customers abroad.

This same service is available to any metal working organization in the United States as proof of the overwhelming superiority of the Simonds Saw. Write Simonds Saw and Steel Co., Fitchburg, Mass., about your metal sawing problems.



Red Streak Inserted Tooth Saws Do Diversified Metal Cutting

Simonds Red Streak Inserted Tooth Metal Saw — the new one with the curved gullets and teeth of high-speed steel has rapidly been adapted for use in various kinds of metal working plants. It is not only the most efficient saw for cutting-off the hardest kind of steel and other metal on which ordinary saws fail, but it also speeds up production in cutting heavy, tough brass which many saws find so difficult. The accompanying illustration shows a battery of machines in a well

known Michigan plant, just stepping through these bars.

There is no clogging or welding of the chips to the sides of the saw or teeth because the scientifically arranged teeth and the curved gullets are designed to prevent just that. Let Simonds Engineers advise you if you have a difficult metal cutting problem to solve. Send your inquiries to metal cutting headquarters, Simonds Saw and Steel Co., Fitchburg, Mass.

"Red Streak" Hack Saw 30 Per Cent Better

A Chicago company writes as follows about Simonds "Red Streak" Hack Saws:—

"Our repair department from time to time has had occasion to use hack saw blades. It has been our custom to obtain these blades from a local hardware store, as we purchase them in small quantities. Recently we picked up a dozen of your 'Red Streak' Hack Saw Blades and our shop reports that these are fully thirty per cent better than any other blades we have used in the past. If we had not come in contact with competitive blades your high quality 'Red Streak' Blades would not have been appreciated."

Simonds Files Worth While

When a man has a close job of filing which depends on skill and knowledge of his occupation invariably he seeks a file which not only bites out the metal fast, but which keeps the surface smooth and eliminates extra labor. That is why you will find SIMONDS FILES in the hands of machinists. They know their business and they know good tools. To them a file is a fine tool and they require the best they can get. SIMONDS FILE QUALITY appeals to their pride of workmanship and ability. Every mechanic should know SIMONDS FILES. They are efficient to the last stroke.

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**THE BLADE
WITH THE
RED BACK
HIGH SPEED
STEEL**

**THE BLADE
WITH THE
RED END
TUNGSTEN
STEEL**

THOSE "RED STREAK" Hack Saw Blades that have shown such a decided increase in cutting efficiency have probably "hit your shop" by now. You'll recognize them by their symbols of high quality—the **RED END** on the tungsten blades for either power or hand use and the brilliant **RED BACK** on the high speed steel blade—the Hack saw for high production. Ask your supply dealer about these new blades with the brilliant, easily recognized symbols.

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**HACK SAW
BLADES**

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GRINDING
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Grinding Case Hardened Gears

**With S. B. Borolon Wheels
in the plant of a large
Detroit Concern**

By the use of S. B. Borolon wheels four machines grind 2000 holes ($1\frac{1}{4}$ inches in diameter and averaging $1\frac{1}{2}$ inches long) per 8-hour day. Limits are .0005 plus or minus.

Make a test in your shop and you will realize that S. B. Borolon wheels give the most service per dollar invested.

Allow us to help you with your grinding work.
Just write to:

ABRASIVE COMPANY

Division of Simonds Saw and Steel Co.
TACONY AND FRALEY STREETS
PHILADELPHIA, PA.

Detroit

Chicago

What About Guide Sets?

● (Continued from page 56)

where it was impossible to produce more than 5,000 pieces in a die set without guide posts and bushings, it was found that the addition of guide posts and bushings increased the "pieces per grind" over a quarter of a million. This was due, of course, to the fact that shearing of dies was eliminated and punch and die were always held accurately in position.

(i) When a die set is equipped with guide posts and bushings it takes up less space on the rack since the punch holder is always on top of the die holder.

(j) Punch or die holder will never be separated from each other and either of the parts lost, when guide posts and bushings are used. This simplifies handling and is a worthwhile time-saving measure.

The impression that the expense of guide posts and bushings is not justified on short runs is rarely true. If the amount of time required for set-up on bolster plates can be cut from 40 to 80 per cent, it is obvious that the shorter the run the more important it is to minimize the set-up time. If the cost of guide posts and bushings is a few dollars extra on the cost of making a die set or buying it, it is obvious that the saving in set-up time, only once, will more than pay for the cost of guide posts and bushings. Another question which sometimes comes up is whether to use bushings with the guide posts or whether to use the punch holder castings instead of a bushing. This is also a matter of costs and here the question of accuracy of the die is an important one.

If bushings are not used and the casting itself is used as the bearing

surface for the guide post, the hole will wear oval. If the run is to be a long one, the bushings are a good investment. If there is play between ram and slide, then bushings are needed. The cast-iron or semi-steel punch holder may compel the use of bushings whereas a cast-steel punch holder might enable a bushing to be dispensed with on shorter runs. Where guide posts and bushings are used and they are properly hardened, ground and lapped, they will last as long as the die. The problem can be answered only on the basis of ultimate cost and the cost of guide posts and bushings must be balanced against the savings from the various items mentioned above. All in all, the trend is very markedly toward the use of guide posts and bushings because they pay.

Hardening Tool Steel

SATISFACTORY results in the hardening of tool steel can only be obtained if the temperature of the furnace is held at the temperature to which the steel is to be heated. Trying to heat a piece of steel to 1,400 degrees in a furnace which is heated to 1,650 degrees will be found unsatisfactory, as the temperature of the piece at the outside and the temperature at the core will vary. Heat travels from the outside to the inside of a piece, therefore the outside will be very hot while the core is relatively cool. Consequently the best results can be obtained by heating the furnace to the desired temperature and then leaving the piece in the furnace until it is of uniform temperature throughout.

Mention MODERN MACHINE SHOP when writing advertisers.

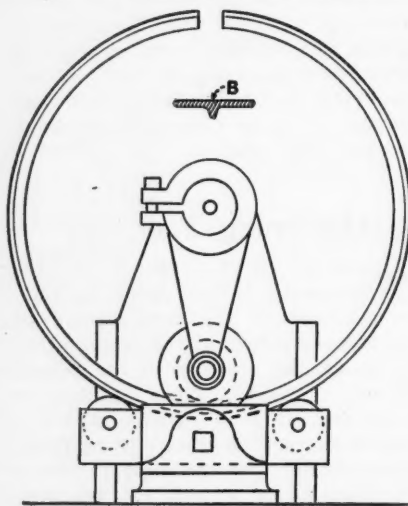
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short-cut in use in your shop, send in a description of it. We will pay \$5 for each one published.

Forming Rings on the Milling Machine

By CHARLES KUGLER

SOME time ago we accepted a job which included the making of a number of steel rings. As the quan-



Sketch Showing Equipment for Forming Rings on the Milling Machine.

tity was too small to warrant the purchase of a forming machine, it was decided that the job should be done on a milling machine. The illustration shows the general design of the fixture that was made up for the job, and the method of performing the operation.

Two rolls of the same size were

made, journals being turned on the ends of the rolls to fit into bearings which were bored in the side plates of an iron box. The box, containing the rolls, was then clamped in a vise which was bolted on the table of the milling machine. A third roll, of larger diameter than the other two and containing a groove to fit the web of the sections from which the rings were to be made, was then made and keyed to the arbor of the machine, as shown. A cross section of the iron is shown at B. Adjustment to obtain the proper curvature was obtained by raising or lowering the machine-table, and a perfect job was made possible at comparatively small cost for equipment.

Preventing Breakage of Expanding Reamers

By R. H. KASPER

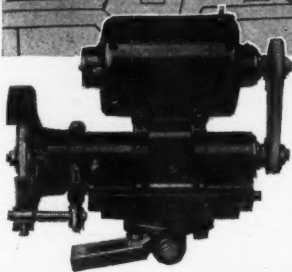
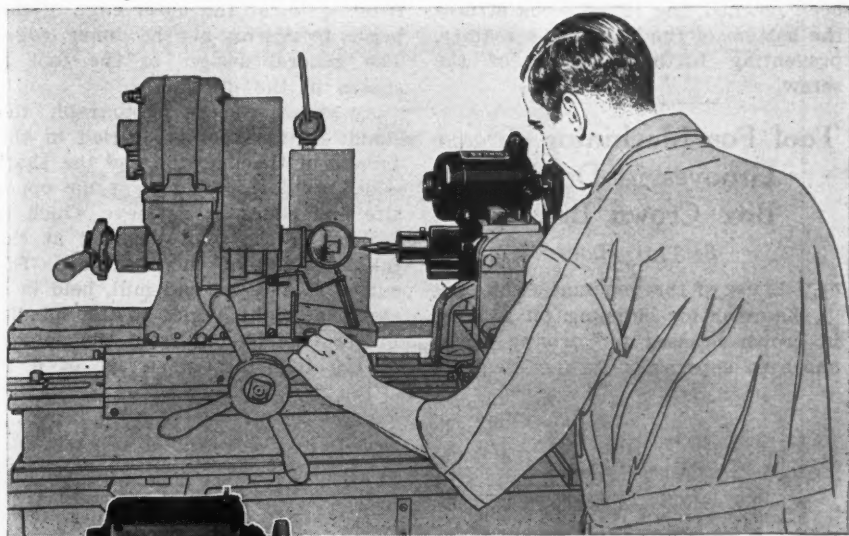
EXPANDING reamers in which the body of the reamer is made to expand by the tapered end of the adjusting screw are sometimes broken by being expanded beyond the elastic limit of the metal. Though the maker usually indicates the maximum ex-



Pin soldered to end of expansion screw to prevent breakage from over-expansion.

pansion to which the reamer should be subjected, the user has no way of determining when that limit has been

A Magnifying Glass and A Dumore Solved This Problem



The No. 3 Multi-Speed Grinder is equipped with a $\frac{1}{4}$ H. P. motor. For production and tool room. Speeds from 1,600 to 40,000 r. p. m. with quick-change pulleys. 3 different sizes of wheel arbors and spindles provided.

THE DUMORE COMPANY
28 Sixteenth St., Racine, Wisconsin

Please send me information on the Dumore line of Grinders, together with a free copy of "Precision Grinding".

Name.....

Address.....

City.....



Reliance Gauge Column Company increases production 200% with No. 3 Dumore, on difficult valve job

This job presented real difficulties: The steel in the valve seat and conical disc is very hard. Extreme accuracy is required. Outside grinding specialists would not undertake grinding the valve seats. Their price for grinding the disc was prohibitive. Both jobs are so fine that they must be ground under a magnifying glass.

But the Dumore No. 3 solved the problem! A very fine grinding wheel, rotating at 40,000 r. p. m. removes .001" from the inside of .055" valve seat diameter, forming a perfect seat. The Dumore is also used in grinding the conical discs of the valves at a 60° angle, with a .005" tolerance. On both jobs, the Dumore increased production 200%!

Let the Dumore solve your difficult grinding problems. Write for details of the complete Dumore line, together with your request for "Precision Grinding".

THE DUMORE COMPANY, 28 Sixteenth St., Racine, Wis.

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DUMORE
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HIGH-SPEED GRINDERS

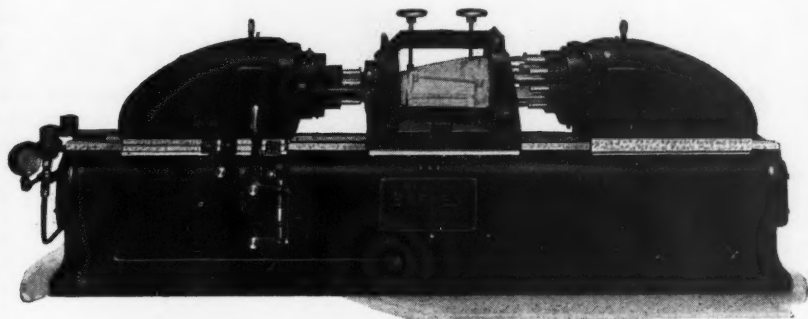
BARNES

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MACHINES



**BARNES No. 420 Horizontal Duplex Crankcase
Drilling Machine**

*May we have your inquiries for
Production Boring Equipment?*

W. F. and JOHN BARNES CO.
ROCKFORD, ILLINOIS

Upright Drills **Screw Presses**
Horizontal and Vertical Production Drilling and Boring Machines

bevel gears, the gear having 28 teeth and the pinion, 12 teeth. Ball thrust bearings take the thrust set up between the gear and the spindle, and between the pinion and the cutting tool.

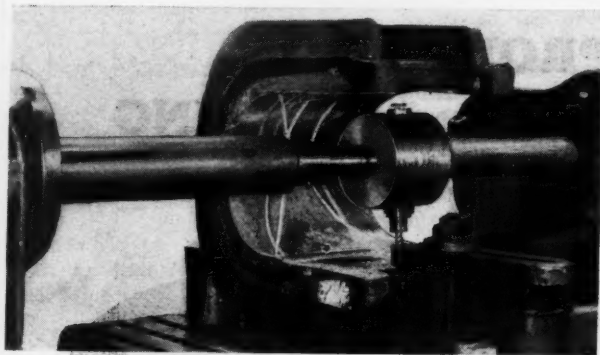
In operation, the cutter is fed into the work to the proper depth, then

A Two-Die Set Automatic Centering-Ejecting Job

By C. G. CROWLEY

STANDARDIZED die sets, where a relatively few types and sizes permit of more than several thousands

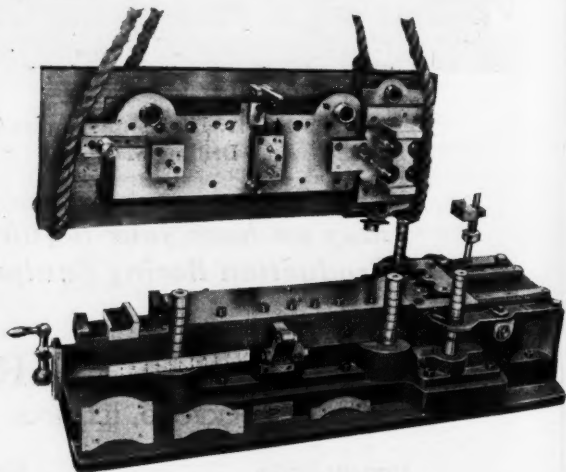
of combinations, provide an interesting task in adapting them to special jobs. Those who appreciate the interchangeability feature of standardized die sets do not proceed with the design and manufacture of a special die set without first analyzing the situation to determine to what extent stand-



Milling Grease Grooves in a Crown Brass.

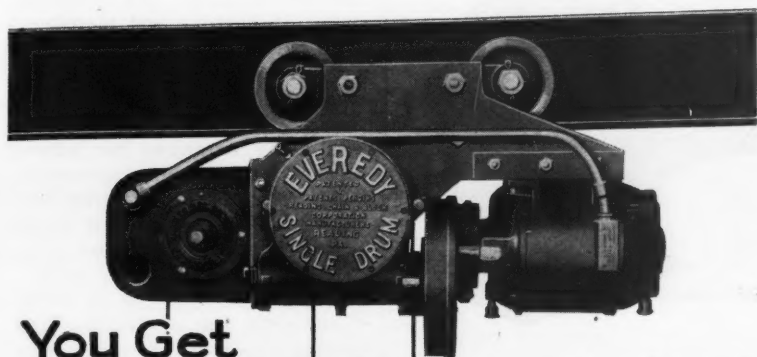
the spindle feed is applied and the spindle, carrying the mechanism, is fed across the work. The spindle actuates the cutter, but the entire mechanism is prevented from revolving with the shaft by a pin in the supporting shaft, the pin riding in a groove in the sleeve as the shaft feeds along with the spindle. The groove is 13 inches long and forms a right and left spiral with a $1\frac{1}{4}$ -in. lead, which is the pattern for the oil groove that is to be cut in the journal box. Approximately two minutes is required to set up a box for grooving and the grooving operation is performed in one minute.

ardized die sets may be converted or modernized to accomplish the de-

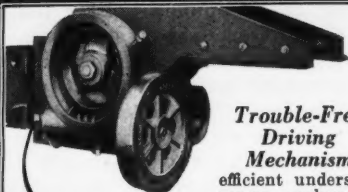


A Two-Die Set Automatic Centering-Ejecting Job, Using Standard Parts.

sired results in an economical manner. The accompanying illustrations shows

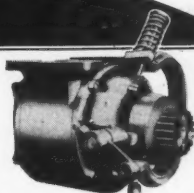


You Get Worth While Features in the READING "Everedy" Electric Hoist

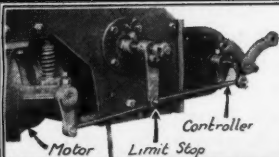


Worm Easily Adjusted for Wear!

Trouble-Free Driving Mechanism
efficient undershot worm—enclosed in an oil-tight, dust-proof casing.



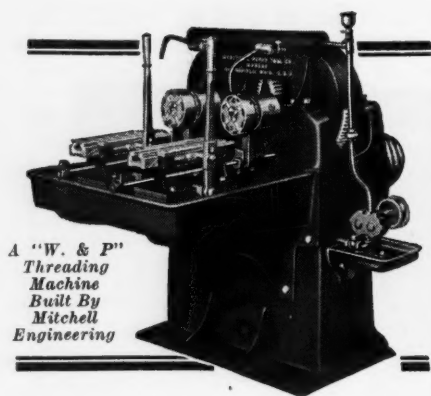
Positive Drift Brake
Composed of two bands. Brake can be removed for relining without disturbing any other part of hoist.



Adjustable Automatic Limit Stop
easily adjusted to any position as far as rope movement is concerned, and is for both upper and lower limits of hook travel.

This view shows the Reading Limit Stop in proper relation to the Controller, Hoist and Motor.

READING CHAIN & BLOCK CORP., READING, PA.



A "W. & P"
Threading
Machine
Built By
Mitchell
Engineering

550 Accurate Threads Per Hour

HERE is a two spindle Automatic Die Type Thread Cutting Machine that combines accuracy and speed!

For example: You can cut five hundred and fifty $\frac{5}{8}$ " U.S.S. threads, standard screw length, per hour with this machine *and every thread will be accurate!*

There is also a model for tapping! Investigate these machines—they may solve your threading problems.

**SEND FOR BULLETIN
TODAY!**

The Mitchell Eng. Co.
SPRINGFIELD, OHIO

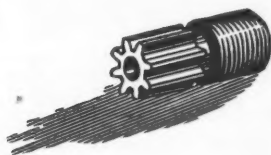
an interesting application of two die sets, which were mounted on a common bolster plate. The operation consisted of parting and piercing $\frac{1}{8}$ -in. steel plates that are used in making singletrees for heavy farm tractor implements. The steel plate is fed into the die in strips, the punches and dies being arranged for adjustment so that different hole centers may be used. The regulating screw shown at the end of the set is used for adjusting the back-post die set (which is the larger of the two sets). The punch holder, working in a "T" slot, floats with the die holder, the two moving together due to the fact that the guide posts hold the punch holder in alignment and position. The set is equipped with automatic devices for centering and ejecting the stock. The job weighs over 3,800 lbs. and measures approximately 4 ft. in length.

The dies, which are of the back-post and center-post type, are mounted on a common bolster plate with Danly socket-head setscrews. Castings for both die sets were made from standard patterns modified for the purpose. The guide posts and bushings are standard. This is a typical instance of a complex job built up from standardized, interchangeable parts, at a considerable saving in time and costs.

Cutting Threads

A lubricant should always be used when cutting threads, not for the purpose of cooling the tool, as threading tools are usually run at low speeds, but to lubricate the point of contact between the tool and the work and thus aid in producing a good job. The shape of the tool makes it impossible to give it all the rake it should have, therefore the shearing action is not so pronounced as when tools that cut on one side only are used.

A Saving of \$12,000.00 in One Year



THIS brass pinion, which has 8 teeth, 32 pitch, $14\frac{1}{2}^\circ$ angle, has a $\frac{3}{8}$ inch face. It is used in a water meter, and is made by one of the largest concerns in the industry.

The High Speed Gear Shaper was substituted for special bench-type gear cutting machines with remarkably profitable results.

On account of the small hole in the pinion, a work arbor for holding the work is impracticable, and an ingenious type of fixture is used on the High Speed Gear Shaper. This fixture comprises an indexing "chuck" having four work-holding stations.

Two pinions held at two of the four work-holding stations are presented to the Gear Shaper cutter at one time. When these two pinions are cut, the fixture is indexed one-half way around, presenting the pinions at the remaining two stations to the cutter.

This manufacturer who replaced his specially designed gear cutting machines with High Speed Gear Shapers saved \$12,000.00 in one year on the first machine installed.

The High-speed Gear Shaper is a mighty profitable investment

Write for copy of booklet No. 12. It presents some interesting facts.

THE FELLOWS GEAR SHAPER COMPANY

Head Office and Works: 78 RIVER ST., SPRINGFIELD, VT., U. S. A.

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Over the Editor's Desk

The Engineer—An Asset Or a Liability?

THE charge is being made that the engineer is largely responsible for the lack of employment which at present is prevalent in some quarters, due to the development of machines and methods whereby production per man is increased and the amount of man-power required per unit is constantly being decreased. Such analyses as have been made of this factor indicate that the theory is a fallacy. The automobile factory is an example of manufacturing efficiency of the highest type, therefore the automobile should serve as a good example. Forty years ago the horse and carriage served as the usual mode of travel for short distances. The percentage of the population who owned horses and carriages was very small, however, and the carriage industry was not outstanding for size. If automobiles had to be built according to the methods in use forty years ago, they would cost several times as much as they do now, restricting their use to a comparatively few wealthy families, and requiring comparatively small factories to meet the demand.

The efficient methods in use in the automobile plants have made it possible to reduce the prices of the cars to a point that enables everyone, practically, to afford cars, thus creating a demand that requires hundreds of thousands of workers to fill. In addition, several hundred thousands of workers are required in the service stations throughout the land, and other thousands are required to build the paved roads which are now necessary because of the automobile. Added to this number are the thousands of oil-field workers, and many more thousands whose vocations

would not exist were it not for the automobile. Altogether, the manufacture, distribution, and maintenance of the automobile provide more than four millions of people directly with a source of income, while other millions derive their incomes indirectly from this same source. The automobile industry is by far the biggest customer of the steel industry; it consumes 85 per cent of the world's rubber supply, 67 per cent of all the plate glass made, 60 per cent of the total output of upholstery fabrics, and so on. And each of these industries has been forced to grow enormously since the development of high production methods, in order to serve both the automobile industry and the rest of the world. An analysis of the situation will show that since the development of high production methods and modern machinery the opportunities for employment have been greater, wages have been much higher, the hours of labor have been shortened, and employment has been much more stable. And this will be found true of other industries besides those manufacturing automobiles. The law of supply and demand seems to work automatically, and workers that are released from one task find that another has been created. The elimination of waste and conservation of energy—which are the first principles of good engineering—are integral with progress, consequently any attempt to obstruct the work of the engineer is an attempt to turn the world backward. Business depressions are psychological, and as soon as we can get over the fear that if we let loose of a dollar we may not get another to take its place, they will be automatically eliminated.

A PRECISION-BUILT DRILLING UNIT

IN EVERY SENSE OF THE WORD



THAT is the best way to describe the C-O Multiple Spindle Drill. It is constructed to give the highest degree of accuracy and speed—to meet the largest production demands. Individual motor drive provides for individual operation of each spindle at any speed. This is an exclusive feature of CANEDY-OTTO Motor Driven Drills.

The vertical mounting of the motors simplifies the power transmission problem. All idlers, pulleys, and twists and turns in belts are eliminated. The machine is completely equipped ready for operation by attaching to a lamp socket. It is furnished in either 2, 3, 4 or 6 spindles, floor or bench type, in the following speeds: 400-850-1,750 r.p.m., 1,000-2,200-5,000 r.p.m., 525-1,400-3,000 r.p.m. and 3,400-5,600-10,000 r.p.m.

Catalog Number 50 fully describes this machine and the complete CANEDY-OTTO Line—send for your copy today!

"Consult our Engineering Department on your drilling problems, whether regular or special."

CANEDY-OTTO
CHICAGO HEIGHTS, ILL.

New York Branch:
407 Broome St.
New York City

*Complete Stock At
All Branches*

San Francisco Branch:
955 Folsom St.
San Francisco, Cal.

New Shop Equipment

Norton Type D 28-In. Roll Grinder

Manufacturers engaged in the cold rolling of metals such as steel, nickel, gold, silver, platinum, zinc, brass, and foil, are constantly being called upon for new standards of quality both in uniformity of gauge and character of finish. As a result of close co-operation between these manufacturers and the Norton Company, Worcester, Mass., the Norton Company has developed a line of heavier machines with which greater accuracy can be obtained than with the machines ordinarily used for lighter work. As a result of intensive development work on wheels, a new type of wheel is also now available with which stock can be removed freely and rapidly, at the same time leaving a finish that has heretofore only been possible by slow and careful grinding.

One of the new machines is the Type "D" 28-inch, built in lengths from 96

features and improvements are incorporated. The proportions of the base and tables are such as to insure rigidity, together with which careful alignment and thorough inspection of all parts insure a quality of work that is unobtainable with lighter machines on large rolls. Other factors contributing to the efficiency of the machine are flood lubrication of the table ways and spindle bearing, application of multiple vee belts for driving the spindle, minimizing vibration, and the careful selection of the grinding wheels.

It is now possible to produce a high quality of finish with less wheel changes than has been the custom in the past. Older practice consists in grinding with not finer than 60 grain, then with 100 or 150 grain, followed by 200 and finally with 400 or 500 grain for the final polish. With the new Type "D" machine, rolls can be finished by following the method indicated in the table below.

I. New Rolls—Hardened Steel

- | | |
|----------------------------|---------------------------------|
| 1. Rough grind | 100 I Crystolon vitrified |
| 2. Semi-finish grind | 46 DK Alundum vitrified |
| 3. Finish grind | 400/A Grade 1 Crystolon shellac |

II. New Chilled Iron Rolls (rough turned)

- | | |
|-----------------------|---------------------------------|
| 1. Rough grind | .36/B—T2 or T3 Alundum Bakelite |
| 2. Finish grind | same wheel |

III. Regrinding Hardened Steel Rolls

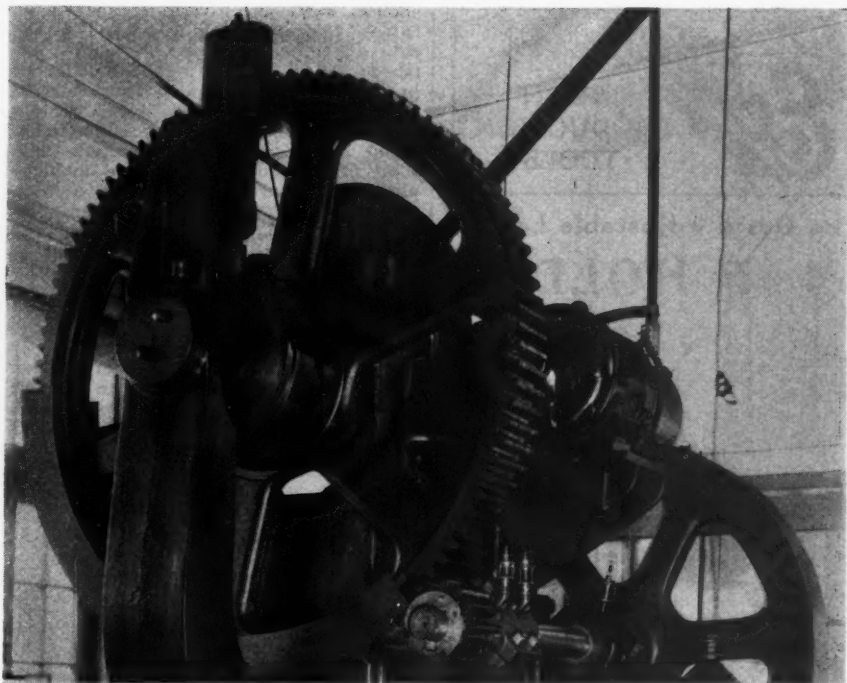
- | | |
|-----------------------|---------------------------------|
| 1. Rough grind | 400/A Grade 1 Crystolon shellac |
| 2. Finish grind | 100 I Crystolon vitrified |

inches up. While the design of the machine is not a radical departure from the usual Norton design, many new

The selection of wheels depends to a great extent upon the size of the roll and the degree of hardness. The table



Norton Type "D" 28-In. Roll Grinding Machine



Big Punch Press Gears

This Formica gear, installed by the Union Gear Company of Boston, on a press operated by the S. H. Couch Company, Norfolk Downs, Mass., has proven how well Formica can stand heavy work and intermittent strains.

Formica gears keep machinery quiet. They make it easier to sell. They make it sound taken care of. Formica gear cutters give prompt service.

THE FORMICA INSULATION COMPANY
4614 SPRING GROVE AVENUE CINCINNATI, OHIO

FORMICA

Eclipse

HIGH PRODUCTION TOOLS

The Quick Adjustable Length

HOLDER

... is the ideal tool for continuous production. It is especially designed for multiple spindle spot facing, counterboring, countersinking, or core drilling to a specified depth.

Instant adjustment is obtained by means of fine screw thread and sliding locking collars. All adjustments are made by hand, without removing the tool from the spindle.

This holder saves its cost on production work in a very short time. Send the coupon today, for full information and prices.

This is Number One of a series of advertisements describing the ECLIPSE Line of High Production Tools. Watch for others to follow.

ECLIPSE COUNTERBORE CO.

DETROIT MICH.

ECLIPSE COUNTERBORE CO.
Detroit, Michigan

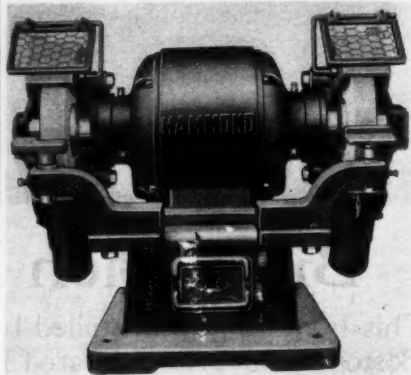
Please send me full information on the
ECLIPSE Quick Adjustable Length
Holder.

Name.....
Firm.....
Address.....
City..... State.....

shown, however, covers a fairly wide range. The following is typical of the rate at which the large rolls are finished: Following the instructions given in the table, new chilled iron rolls 24 in. diameter x 30 in. long were ground to a highly reflective finish, removing about .030 in. from the diameters, in a total of 25 hours. This time includes not only the roll bodies, but a high finish on the necks and fillets as well. Formerly 39 hours were required, and the finish obtained was not as good.

Hammond "Type W" Bench Type Electric Grinder

A bench type electric grinder, known as the "Type W" and made in 1½ and 2 h.p. capacities, has been placed on the market by the Hammond Machinery Builders, 1622 Douglas Ave., Kalamazoo, Mich.



Hammond "Type W" Bench Type
Electric Grinder

The design of the machine is identical with that of the larger machines made by this company, this machine being especially adapted for general purpose work and light production.

The motor is totally enclosed, eliminating possible injury from accumulation of dirt or emery, and is designed and built especially for grinder service. It is of the 40 degree C. type, capable of withstanding overload of 100 per cent beyond its rated capacity. Push button control is conveniently mounted on the pedestal with an automatic motor starter mounted inside the pedestal.

"Saves 26 expensive dies

**"and
does
work
far more
satisfactorily than
hand shear work."**



This illustration shows Mr. Geo. Fisher, Foreman, cutting a sheet metal part for a press table. The operation is done by cutting to a template.

ACCORDING to the American Laundry Machine Company, it required, formerly, six hours to complete one press table.

By a slight improvement in design, made possible by the use of the Campbell Nibbling Machine, this time was cut from six hours to two and one-half hours.

We find this to be the case in hundreds of instances. Campbell Nibbling Machines soon pay for themselves when you consider the cost of dies for parts which do not run into large production quantities.

Campbell Nibbling Machines are made in six sizes to handle material up to 3/4". Monel Metal, steel alloys and practically all sheet material can be shaped. There is no distortion to the metal—the cut edge is comparatively smooth so that for many purposes no finishing is necessary.

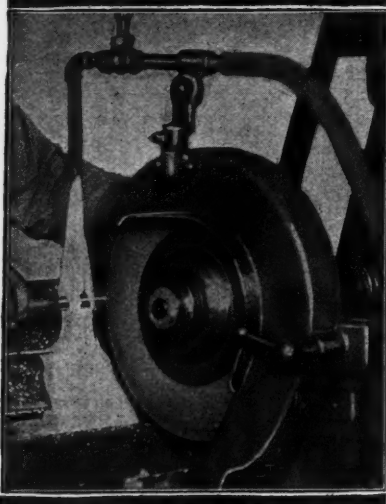
Campbell Nibbling Machine can be adapted to many special purposes. Submit your problems to us. Address—

ANDREW C. CAMPBELL, Inc.
BRIDGEPORT, CONNECTICUT

CAMPBELL NIBBLING MACHINES



A STEADY FLOW....



No splash, no spurt . . . yet *volume* is there—continuous volume in a steady flow! Learn the secret of constant, uniform, copious coolant supply, with . . .

GUSHER COOLANT PUMPS

Write for the 1930 catalog

The Ruthman Machinery Co.
532 East Front Street
CINCINNATI, OHIO

estal. This mechanism protects the motor from overload, low voltage, and phase failure. The chrome nickel steel shaft, which is oversize, floats in oversize ball bearings that are protected from dirt and grit by double labyrinth seals.

Convenient oil cups with oil lever gauge and flushing plug are regularly supplied, and standard equipment also includes universal adjustable wheel guards which can be adjusted to compensate for the wear of wheels, at the same time maintaining the same distance between the wheels and the guard, which is necessary for safety. The single phase machine is supplied with the condenser-type motor which has the same general characteristics as the power line motor, capable of starting under heavy load and withstanding excessive overload. Eye shields of shatterless glass offer protection and convenience to the operator, and pedestals of unique design provide a maximum of foot room.

The machine is furnished for 110, 220, 440 and 550 volt, 1, 2 or 3-phase alternating current, and for 110 and 220 volt direct current service. It is supplied in both bench and floor types, the machine of 1½ h. p. capacity for grinding wheels of 10-in. diameter with 1½-in. face and the 2 h. p. capacity for wheels of 12-in. diameter by 2 in. face.

Williams Water Pump "Superrench"

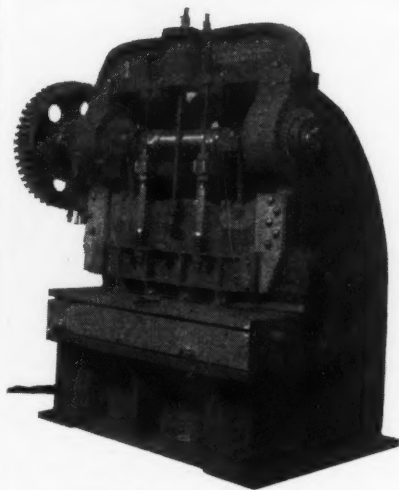
To facilitate the adjustment of the packing-gland nut on the usual type of automobile water pump, J. H. Williams & Co., Buffalo, N. Y., has



Williams Water Pump Pattern "Superrench"

brought out the Water Pump Pattern "Superrench" shown in the illustration. The wrench is made with 12-point (double hexagon) opening, which makes it possible to rotate the nut completely where the swing of the wrench is limited to 30 degrees. The thin head and narrow jaws permit easy operation

EFFICIENCY—DEPENDABILITY



Gate Shear, Medium Size

Both Prime Factors Built in

POWER PUNCHING and SHEARING

Machinery Made By

THE LONG & ALLSTATTER CO.
HAMILTON, OHIO

A superior and more complete line than ever, for perforating and cutting off metal in practically any size or shape

**STEEL PRESS BRAKES
ALLIGATOR SHEARS
POWER PRESSES**

Shapers that are Producers!

SMITH & MILLS

HIGH SPEED

CRANK SHAPERS

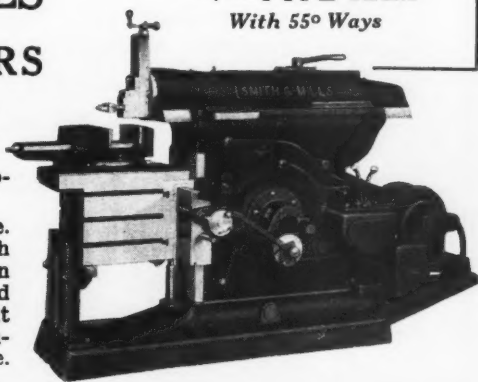
"V"-TYPE RAM

With 55° Ways

DESIGNED for accurate work at high speeds, these machines will be found equally efficient on tool room work or production.

Made in sizes 12" to 32" stroke. 12", 14", 16", 20" and 25" with Gear Box single pulley belt driven or motor drive, also 16", 20" and 25" B. G. cone drive with belt shifter. 32" B. G. all geared single pulley belt drive or motor drive.

Write For Catalog



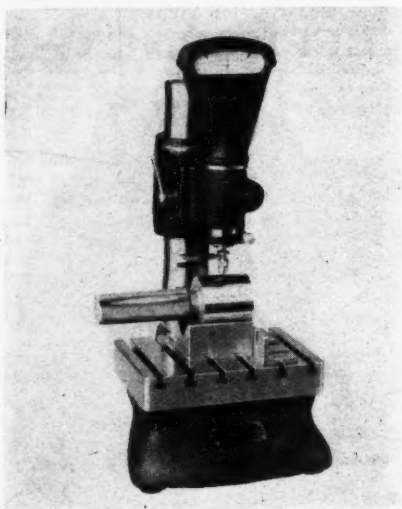
THE SMITH & MILLS CO., Cincinnati, Ohio

in the close quarters in which the water pump is usually located, and the gripping power is such that the wrench cannot slip in operation. The wrench is forged from chromemolybdenum steel, giving it the maximum of strength and toughness, and is heat-treated and chrome-plated all over, with polished head.

Societe Genevoise Micro-Indicator Support

The Societe Genevoise d' Instruments de Physique of Geneva, Switzerland, has put on the market through its agents, The R. Y. Ferner Co., Investment Building, Washington, D. C., a stand for use with the Micro-Indicator recently developed by this manufacturer. The stand is built with the accuracy requisite for use with the micro-indicator. The base and column of the stand are of very heavy construction.

The table for supporting the pieces being tested is 5 x 7 inches in area and is made flat throughout within less than 0.0001 inch. This table is provided with six T-slots which serve for securing in any position on the table



Societe Genevoise Micro-Indicator Support.

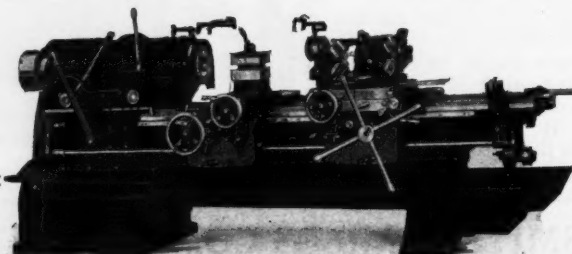
two angle plates, which may be so placed as to limit the position of the

You'll Get....

... Increased Production ... Simplified Operation ... Big Machine Rigidity ... Small Machine Ease of Control ... and Flexibility ... in the New CINCINNATI ACME TURRET LATHE. Send for a New Bulletin!

The Acme Machine Tool Co., Cincinnati, O.

No. 1
or
No. 2



Semi or
Full
Universal

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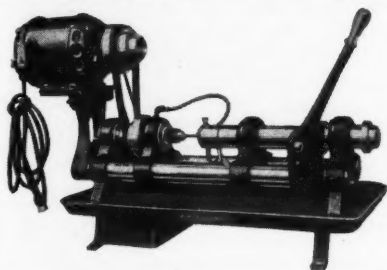
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Whirlwind

HORIZONTAL DRILLING MACHINES



**Increase Production 50 to 100%
Over Vertical Drill Methods**

THE WHIRLWIND will increase drilling production 50 to 100% over that of a vertical drill press. It is adaptable to practically all small drilling and reduces to the minimum the expense of resharpening and replacing drills. This has been proven in many of the country's largest production shops.

Drill MORE Holes in LESS Time

It will surprise you to find how much faster you can do *Production Drilling* with a WHIRLWIND Horizontal Drilling Machine. Its horizontal construction permits faster loading of parts to be drilled, while the reverse movement of the feed lever *automatically* ejects the finished work.

Write and tell us what you are drilling and we'll gladly tell you how many pieces per hour we will guarantee the WHIRLWIND to drill.

WHIRLWIND PRODUCTS CO.

1737 Ludlow Ave., Indianapolis, Ind.

CONNECTICUT BROACHES

*Combine
Operations!*



Combining operations always results in time savings and lower costs. The Connecticut combination round and spline broach obtains these results by broaching the drilled hole to size, cutting the splines, and removing the burr *in one operation*. Besides, the accuracy of the job is improved.

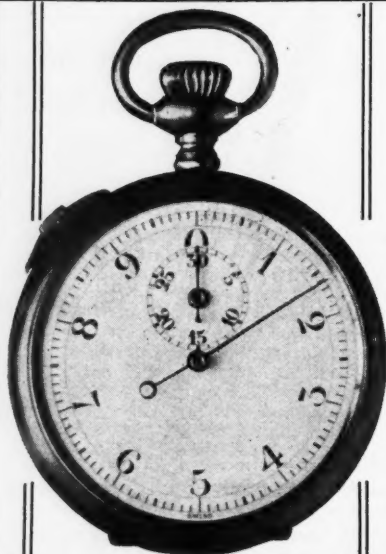
Investigate the possibilities of these tools in your plant. Send us a description of your job and let our engineers recommend a broach that will be guaranteed to do your job better!

The CONNECTICUT BROACH & MACHINE CO.

NEW LONDON, CONN.



ACCURATE TIME



30 DAYS FREE TRIAL

K EEN competition of modern business demands that time and task standards be accurate for every operation. Hough Precision Time Study Equipment scientifically developed by master engineers and now in use in a long list of varied industries, will give you unfailing accuracy with minimum pencil work in determining your figures. Catalog H100 will show you how this precision equipment can help solve your production problems—Write for it today.

HOUGH TIME STUDY WATCHES

AND PRECISION TIME STUDY DEVICES

THOMAS R. HOUGH ASSOCIATES
INDUSTRIAL ENGINEERS
5337 Belle Plaine Ave. Chicago

pieces being measured or of a V-block for the support of cylindrical pieces, as shown in the illustration. The Micro-Indicator is supported in a heavy arm secured to the column by a strong clamp which permits turning the arm through any angle over the plate, according to the best position in which to place the work pieces. The axis of the Micro-Indicator is $\frac{3}{8}$ in. from the face of the column. A fine vertical adjustment is provided on the arm for raising and lowering the piece holding the Micro-Indicator, operated by a large composition head on the end of the adjustment screw. A clamp prevents any further movement.

To accommodate pieces of extra large area or having a shoulder or other projection which would otherwise interfere with suitably placing the piece on the table, an adjustment of the table forward from its central position is provided, by which the table may be set forward $\frac{1}{4}$ inch. This would make it possible to balance flat pieces as large as 12 inches in width or diameter on the table for measurement. The vertical capacity of the apparatus is 6 inches when using the spherical contact point on the Micro-Indicator. As the holder of the spherical contact point slips over the end of the contact plunger of the Micro-Indicator and this contact plunger has a hardened flat contact point at its end, the capacity can be increased to $6\frac{1}{2}$ inches when the spherical contact point is removed.

With the help of the two angle plates and the V-block, without use of special fixtures, the apparatus may be used for checking the three dimensions of flat blocks, the diameter of cylindrical pieces, the outer diameters and thickness of rings and ball or roller races, the diameters of steel balls, the major diameter of screws, the thickness of thin sheets or ribbons of material, or the diameter of wires and rods.

"General" Polishing Wheel Set-Up Machine

A polishing wheel set-up machine that was developed for use in the plant of the General Spring Bumper Corporation, Grand Boulevard at Russell St., Detroit, Michigan, has proved so popular with those who have seen it that it is now being marketed by the firm

MODERN CHUCKS



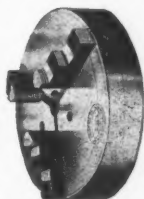
No. 264—Independent Chuck

A MODERN lathe cannot meet your demand without a modern chuck—chucks which combine accuracy, strength and efficiency.

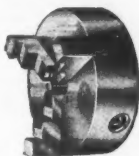
UNION Chucks are such. They are designed for accuracy, built for strength. They will go far toward insuring the service you require.

The Union Catalog will show you the proper chuck for every class of work. Permit us to help you in your chucking problems.

*Send for Catalogs on
Union Chucks and Hoists*



No. 153—Universal Chuck



No. 83—Combination Chuck

UNION MANUFACTURING CO.

NEW BRITAIN

CONNECTICUT

27 S. Jefferson St.
Chicago, Ill.332 Sycamore St.
Cincinnati, Ohio26 Cortlandt St.
New York City, N. Y.661 Folsom St.
San Francisco, Cal.440 First National Bank Bldg.
Houston, Texas

Nielsen

Live Centers

Stand the
"Gaff"!



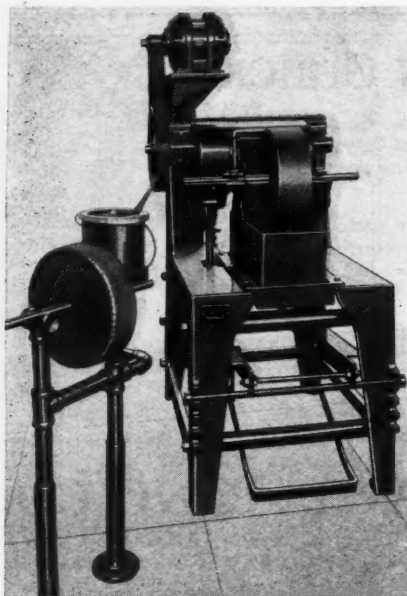
THE stamina of NIELSEN Live Centers has been proven in a recent demonstration of tungsten carbide cutting tools at the Case School of Applied Science.

A standard No. 6 NIELSEN Live Center was placed on a turret lathe equipped with a tungsten carbide cutting tool. A cut $\frac{5}{8}$ " deep with a feed of .037" per revolution was taken in cast iron at a cutting speed of 500 surface feet per minute. Next steel with an analysis of .50 carbon, .75% chrome and $1\frac{1}{2}\%$ nickel was turned. A cut $\frac{1}{4}$ " deep with .037 feed per revo-

lution was taken at a cutting speed of 200 feet per minute. The center stood up under this cutting load without chatter and showed no sign of breaking down or burning.

There is NIELSEN Live Center for every center requirement—write for bulletin.

≡ (NIELSEN, INC.) ≡
LAWTON, MICHIGAN



"General" Polishing Wheel Set-Up Machine

mentioned. The machine, which is regarded as the most important contribution to the polishing industry since the advent of the automatic polishing machine, reproduces, mechanically, the motions made by an expert polishing wheel set-up operator. The machine applies abrasive correctly, economically, and uniformly on any size of wheel from 5-in. diameter by 1-in. face to 20-in. diameter by 6-in. face. Larger wheels can be covered, if desired. Particularly on the larger sizes of wheels, the machine does a much better job than can possibly be done by hand, due to the lack of uniformity with hand work.

Careful and repeated time studies show direct savings, by use of these machines, of better than 66 per cent of the man labor required by the old hand method, plus an increase of more than 20 per cent in production from a wheel mechanically set up as compared with a manually-prepared wheel. Another advantage of the machine lies in the fact that an expert polisher is not required to operate it. Any one, with a little experience, can do a better job of setting up a wheel by using this

WHITON LATHE CHUCKS

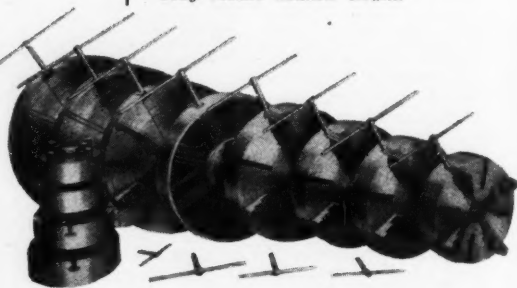
*For
a Sure Grip!*

WHEN work must be held rigidly and securely for accurate machining at top speeds—WHITON Lathe Chucks prove their superiority!

WHITON Chucks—and there's one for every requirement—are good chucks. Their design and workmanship assure you dependable service over a long period of time.

Get a WHITON Catalog—it shows the complete line of WHITON Chucks as well as many special chucks built for special requirements.

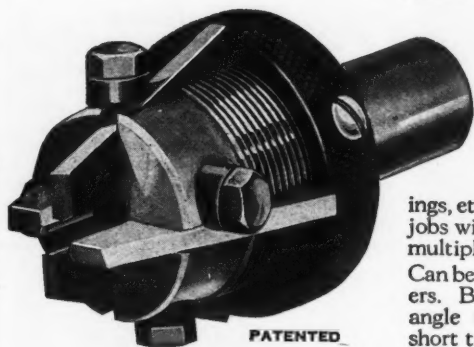
Here is a group of WHITON Steel Body Independent Chucks designed to hold heavy work under heavy cuts at high speed. The one-piece body resists sudden strain.



**THE D. E. WHITON
MACHINE CO.**
NEW LONDON CONN.

Genesee Adjustable Hollow Mill

Made in 7 different styles



Has adjustable, replaceable blades and can be replaced at nominal cost, making it unnecessary to continually buy new tools.

The ideal tool for finishing your forgings, castings, etc. Do your several operation jobs with Genesee inserted blades multiple operation tools.

Can be fitted with drills and reamers. Blades can be ground any angle to point work and turn short tapers.

A Genesee Adjustable Hollow Mill can be made for every job

WRITE FOR CATALOGUE

GENESEE MANUFACTURING CO., Inc.

ROCHESTER, NEW YORK

ACCURACY

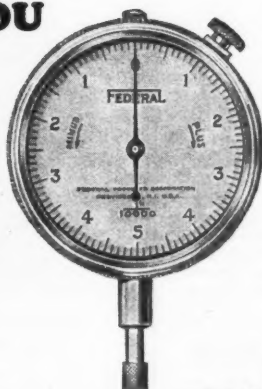
that will

SURPRISE YOU

When .0001" is measured as easily as .001"—that's close accuracy!

But that is exactly what you can do with the Federal "16" Dial Indicator. It is particularly adaptable to close and accurate work.

The Federal "16" has



jeweled bearings, solid bronze alloy die cast case with integral stem, stainless steel bushings, watch movement construction, chromium plated rack—all exclusive Federal improvements which assure you years of dependable service.

Send for Catalog

**FEDERAL
PRODUCTS CORP.**

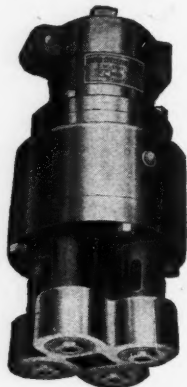
Providence, Rhode Island

Branch Offices

CHICAGO CLEVELAND DETROIT

Speed Up DRILLING OPERATIONS

with a



U.S. Drill Head

WITH this simple attachment on your one-hole-at-a-time drilling machine, you can drill two, six, a dozen, or fifty holes, if necessary, in the same time it takes to drill one.

The drill head shown above is a single purpose tool for drilling four holes at one time. It is a fixed spindle multiple head, but we also make adjustable spindle multiple heads, which can be used on a variety of jobs. What is your problem? We will design a U. S. Multiple Drill Head to meet your particular needs. Send us your blue print NOW.

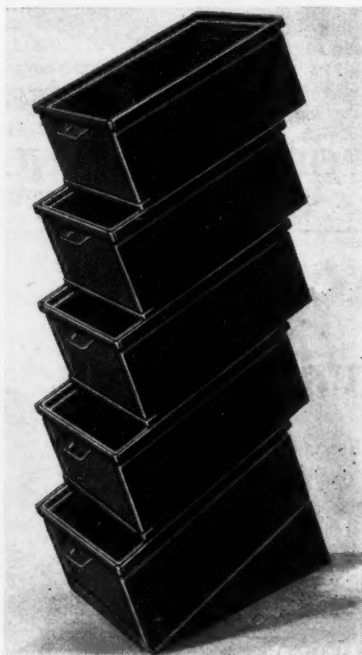
**The United States
Drill Head Co.**

1954 Riverside Drive
CINCINNATI, O., U. S. A.

machine than anyone can do by hand, and can perform the operation much faster.

All-Steel-Equip Company Stock Boxes

A simple but effective arrangement for stacking stock boxes, whereby space can be saved, a considerable amount of handling can be eliminated, and the boxes can be utilized as bins for material, has been worked out by the All-Steel-Equip Company, 16 John St., Aurora, Ill. As can be seen in the illustration, the boxes are stacked in a slanting position, the bottom box being held by a special riser and spacers being



All-Steel-Equip Company's method of stacking stock boxes

placed in the front of each box to hold the next higher box in position. The spacers not only keep the stack perpendicular and evenly balanced, regardless of the number of boxes in the stack, but they also provide an opening through which small parts or a

Drill Around Corners

WITH A

Koza Right Angle Drill

WHEN it is necessary to put in a hole or drill out a broken bolt in a hard-to-get-at-place—a Koza Right Angle Drill or Grinder will prove itself worth its weight in gold.

Koza Right Angle Drills and Grinders eliminate the necessity of tearing down a machine, to reach the broken bolt or part, by drilling around the corner—at right angles.

These tools may be used for drilling, keywaying or countersinking. There is a tool for every requirement—in every industry.

Write for Bulletin

CHAS. A. KOZA

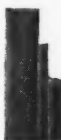
464 AUGUSTINE STREET
ROCHESTER, N. Y.

PRECISION MEASURING INSTRUMENTS



ACCURACY

TO 75/MILLIONTHS OF AN INCH

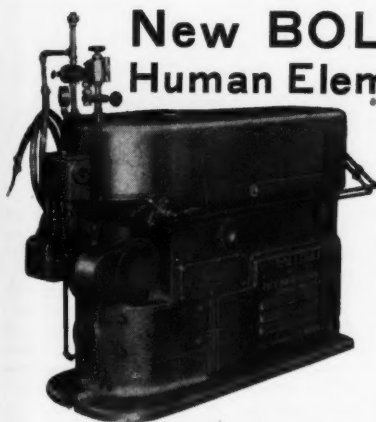


Swedish Gage Micrometers are of uncanny accuracy—modern in design. Graduated parts have a dull finish permitting quick, accurate reading. They are sold at civilized prices on a money back guarantee. Send today for booklet and prices.



SWEDISH-GAGE-CO. OF AMERICA

17310 Woodward Ave., DETROIT, MICH.



Model No. 2 Bolender Gear Burnisher

New BOLENDER Eliminates Human Element In Gear Burnishing!

PERFECT, smooth running gears—so necessary in modern industry—can be obtained more efficiently with the New Model No. 2 BOLENDER GEAR BURNISHER.

New features of this machine include a completely automatic burnishing cycle, eliminating the human element and assuring absolute uniformity, a capacity for gears from 1½" to 14" and wider, Timken bearings throughout, Logan Air Equipment, and GE-CM&T mechanical-electrical controls conveniently centralized.

Write for a bulletin! It will show you how this machine will improve the quality of your gears.

CITY MACHINE & TOOL WORKS

GEAR GRINDING CHUCKS-GEAR CHAMFERING MACHINES-GEAR BURNISHING MACHINES

EAST THIRD AT JUNE



DAYTON, OHIO, U.S.A.

Coast to Coast KEYSEATER

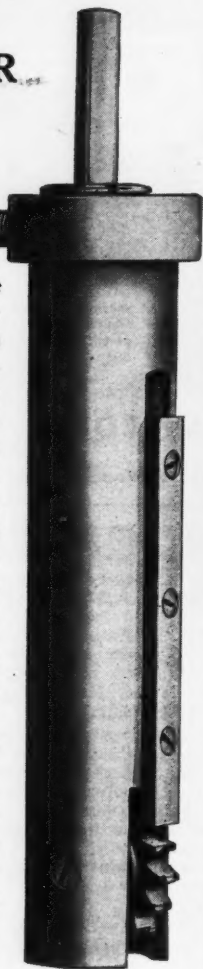
USED
ALL OVER
THE
MAP

The miller fits in the hole receiving the keyseat and while it is sliding thru, the cutter is rotary and mills the keyseats. The miller passes thru the hole just once to complete the keyseat. These tools are made in many different diameters and we make many specials to meet with requirements. Many of our customers have a separate tool for specified jobs. This means a great saving on work which can't be keyseated very readily by other methods. Many of the largest companies in America are using these keyseaters.

Ask for Catalog Q.

National Machine Tool Co.

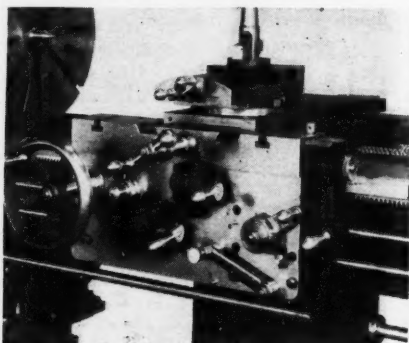
2271 Spring Grove Avenue
CINCINNATI, OHIO, U. S. A.



man's hand can be inserted without difficulty. The spacers can, however, be made to accommodate the part that is to be stored. With the boxes resting at an angle, parts will automatically roll to the front of the box where they can be both seen and reached. With this arrangement, inventories can be kept by box measure and full boxes substituted when the stock is depleted.

Bradford "Kant-Slip" Apron Feed Mechanism

The Bradford Machine Tool Co., 659 Evans St., Cincinnati, O., has changed the design of its apron feed mechanism and is now applying the new mechanism to the full line of Bradford lathes, from the 14 in. to the 48 in. swing. The design of the new mechanism in-



Bradford "Kant-Slip" Apron Feed
Mechanism

cludes several outstanding features such as (1) a powerful disengaging as well as engaging movement for a friction engaging type of feed mechanism, (2) smooth, powerful and instantaneous feed engagement and disengagement, accomplished by a single movement of a small lever, (3) simplicity and compactness in combination with generous size stems and bearings—a type of construction which is made possible by departure from the usual tandem arrangement of these parts, (4) ease and quickness of operation, and (5) absence of frequent adjustments, due to the fact that the mechanism automatically takes up its own wear as such wear occurs. It is said that this apron feed mechanism makes it possible to take ex-

GALL

3

Reduce Your Costs with these GRAND RAPIDS GRINDERS

HERE are two machines which are reducing tap and drill costs in thousands of plants throughout Industry.

The first is the GRAND RAPIDS TAP GRINDER

—an ideal machine for properly grinding taps, grinding all flutes of the tap exactly alike. You can grind practically any right or left hand tap with this machine in less time than required by other methods.



The second is the GRAND RAPIDS DRILL GRINDER

ER, which requires only one adjustment when changing from one size drill to another—that of the tailstock to accommodate the length of the drill. Unskilled operators

can grind perfect points with this machine as the drill

is automatically placed at the

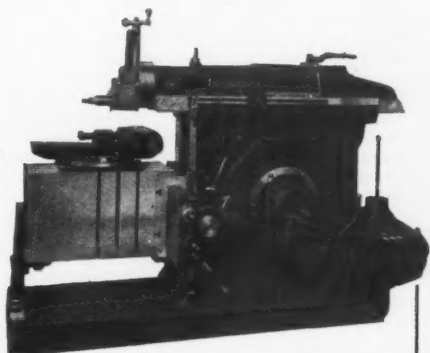
correct grinding angle.

Let us prove to you the value of these GRAND RAPIDS TOOLS in your shop—write for bulletins.



GALLMEYER & LIVINGSTON CO.

338 Straight Avenue, S. W.
GRAND RAPIDS, MICH.



...You Can't Go Wrong

—with a—

COLUMBIA SHAPER

WHEN you want a shaper that will increase production, lower costs and work to closer accuracy limits . . . specify COLUMBIA . . . you can't go wrong. Its past performances prove that!

Among the features which make the COLUMBIA such a safe bet are: centralized control, cross rail locked by one lever, longer stroke on angular cuts, patented quick-change feed, extra large table with improved outer support, selective speed box with hardened alloy steel gears, and flood lubrication.

Bulletin 17 contains full details. Send for your copy today.

THE COLUMBIA MACHINE TOOL CO.

HAMILTON OHIO

ceedingly heavy cuts with ease and certainty and with no sacrifice of safety. Provision is made against damage in case the carriage should feed against the head or tailstock. No pressure is needed to keep the feed mechanism engaged, as the slight friction engaging angles keep the parts in permanent contact, after they have been engaged. Moreover, the small eccentricity of the eccentric engaging shaft effects the automatic locking of these parts, thus, conversely, a powerful eccentric-operated disengaging movement for the feeding mechanism is always instantly available.

Berjo Vise

A vise with jaws of compensating segments that will adjust themselves to the shape of any irregular-shaped object has been placed on the market by The Avey Drilling Machine Co., P. O. Box 487, Cincinnati, Ohio. The mechanism of the vise incorporates a simple mechanical principle that enables multiple compensating jaws to apply equal pressure to all parts of the piece being held, the gripping action being fast and positive.

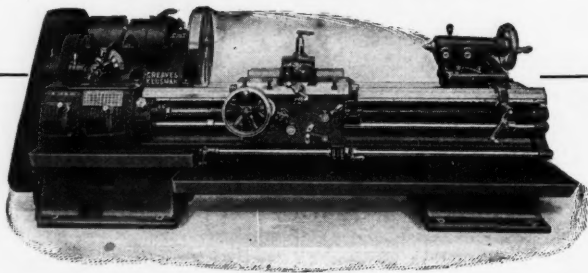
The jaws of the Berjo vise are made of sliding steel segments, each approximately $\frac{1}{2}$ -in. wide. A chamber at the rear of the segments is filled with small steel balls. As the compensating segments of the jaw adjust themselves to



The Berjo Vise with top plate removed to show compensating jaw segments.

the shape of the article being held, the steel balls shift position instantly and automatically distribute themselves so that equal pressure is applied to all parts of the piece. Odd-shaped pieces are held as securely as the ordinary vise holds straight pieces. The vise is particularly suitable for the tool room

G. K. SINGLE LEVER CONTROL BOOSTS PRODUCTION!



IT IS the simplified operation of the G. K. Single Lever Control Lathe that increases production.

No longer is it necessary to search through several combinations of Levers for the right spindle speed. The G. K. Single Lever Control eliminates all this. Just reach for

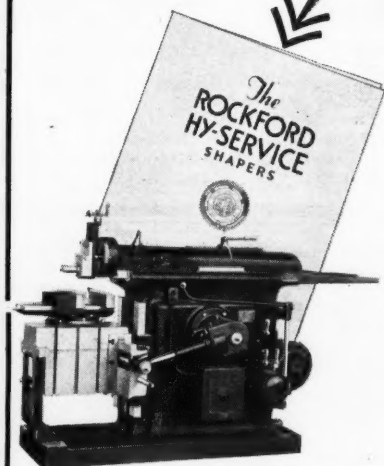
a single lever . . . and instantly select any speed of an extremely wide range. An index plate tells at a glance how to obtain the desired speed.

But that's not the whole story . . . there are many more features described in the G. K. Catalog! Let us send you a copy.

THE GREAVES-KLUSMAN TOOL CO.
CINCINNATI, OHIO

»GET THIS CIRCULAR

before buying
A NEW SHAPER



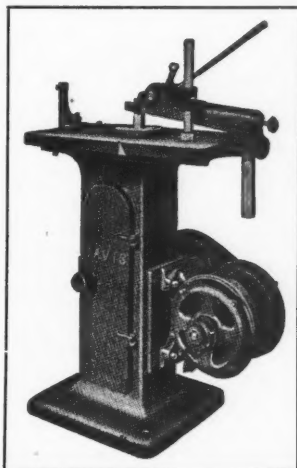
THE circular indicated above tells why Rockford Hy-Service Shapers produce highly accurate work—why they are durable and easy to operate—why they meet fully practically all the requirements of tool-room and production work. It describes features of design and construction, lists complete specifications.

It will be to your advantage to read this circular carefully before buying a new shaper. Send today for a copy—and remember that Rockford Hy-Service Shapers are high grade tools which sell for a remarkably low price.

Rockford Machine Tool Co.
2414 Kishwaukee Street, Rockford, Ill.

100

PER HOUR ON THE



DAVIS KEYSEATER

The Nash Motors Company has used three No. 2 Davis Keyseaters for cutting steel oil pump gears. One hundred of these gears per hour has been their average production with this machine.

The Davis Keyseater will efficiently and economically handle any job from $\frac{1}{16}$ to 1 inch wide, and up to 12 inches. It also will cut taper keyways. Shall we send you full information?

SEND COUPON NOW!

DAVIS KEYSEATER CO.
250 MILL STREET, ROCHESTER, N.Y.

I am interested in the Davis Keyseater.
Send me full information.

Name.....

Firm.....

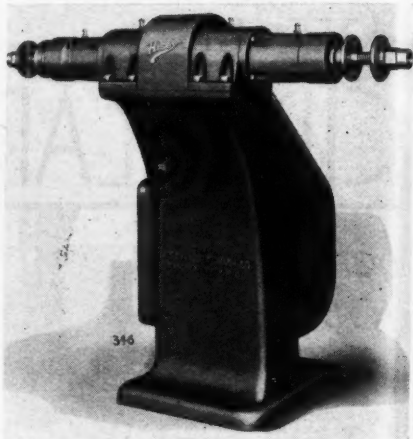
Address.....

or shop in which variously - shaped pieces are made.

Two main jaws—one fixed—one movable—hold the segments and balls. The usual type of lever is provided to operate the movable jaw. Levers at the side of the vise make it possible to bring the compensating jaws into parallel alignment, and lock them in position, if desired. The Berjo vise is built in a number of styles and sizes with plain or swivel base, either for machine or bench use. The design embodies both simplicity and strength, all parts being made of tested high-grade steels.

"Hisey" Model M Texdrive Buffer

The Hisey-Wolf Machine Co., Cincinnati, Ohio, has brought out a buffing and polishing machine, the design of which incorporates a number of unusual features. The machine is of "goose-neck" design, the spindle and buffing wheels extending out from the base of the machine, thus permitting easy handling of large or odd-shaped pieces. This feature enables the operator to



"Hisey" Model M Texdrive Buffer

stand close or sit comfortably at the machine where the work permits.

The motor mounting is of the external type with a rigid four-point support. It is said that this method of mounting precludes the possibility of inoper-



Haskins
HS-4
Equipment

Modern Machine Shops Are Specifying **HASKINS** FLEXIBLE SHAFT EQUIPMENT

THERE'S a reason for this—many, in fact. Haskins saves time and labor—shops report a 10% to 50% saving by its use.

Haskins is adaptable to almost every manufacturing and assembly process. Durable built, speedy, vibrationless and efficient, they answer the need for hand tool flexibility with power.

Let us show you where a Haskins tool fits into your machine shop.



Die Grinding with
Haskins HS-4 Equipment

Write for
circular
"HASKINS
Equipment
for the
Machine
Shop."

R.G. HASKINS COMPANY

Portable Flexible Shaft Machinery

4653 W. FULTON STREET, CHICAGO, ILL.
Branch Offices in Principal Cities

The PULLMORE Industrial Clutch

*Adaptable
Dependable
Compact
Efficient*



THESE are the reasons the PULLMORE has been adopted as standard by leading manufacturers of Lathes, Laundry Machinery, Drilling and Boring Machines, Snow Plows, Milling Machines, Testing Machines, Fire Fighting Equipment, Grinding Machines, Cranes, Rubber Working Machinery, and many others.

Why not let us submit recommendations on the Clutch application you may have? Mail the coupon now.

Rockford Drilling Machine Co.

10 Catherine Street
ROCKFORD ILLINOIS

ROCKFORD DRILLING MACHINE CO.

Rockford, Ill.

Send me a copy of the PULLMORE Industrial Clutch Catalog.

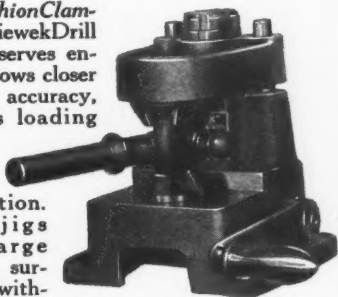
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Firm
Address
City State.....
MMS-6

Siewek Drill Jigs

The *Cushion Clamping* of Siewek Drill Jigs conserves energy, allows closer drilling accuracy, reduces loading time, and increases production.

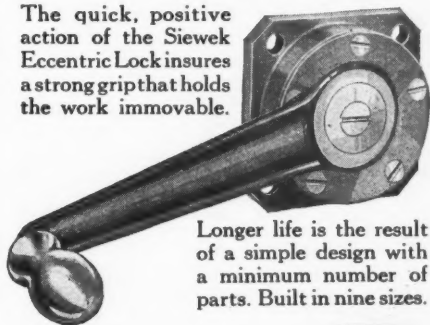
These jigs have large wearing surfaces to withstand hard

usage and to maintain their accuracy. It is built in eight types.



Siewek Eccentric Locks

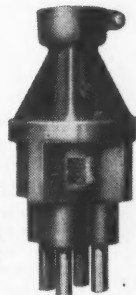
The quick, positive action of the Siewek Eccentric Lock insures a strong grip that holds the work immovable.



Longer life is the result of a simple design with a minimum number of parts. Built in nine sizes.

Siewek Drill Heads

Siewek Drill Heads, when used in combination with Siewek Drill Jigs, insure a tool set-up that will give maximum production over a long period of time. There is a Siewek Drill Head to meet every requirement.



WRITE FOR CATALOG

Siewek Tool Co.

10232 Woodward Ave., Detroit, Mich.



STANDARD DIAL INDICATOR



Available in two sizes of
face—2 in. and $2\frac{1}{2}$ in. diam.

THIS advanced type of Dial Gage is made in a Gage making shop, to the finest of gage standards. Unit construction with the fewest number of parts, all enclosed in dust proof cover. Sturdiness that stands hardest shop. Supremely accurate because new method of cutting gears and rack makes this possible. Available in two sizes, 2-in. and $2\frac{1}{2}$ -in. in a full range of graduations. Write for booklet.

STANDARD GAGE CO., Inc.

Poughkeepsie, New York

The Standard Gage Co.,
Poughkeepsie, N. Y.

I would be interested in receiving copy
of your catalog covering your "STAND-
ARD" Dial Indicator.

Name..... Title.....

Firm

Address

City..... State.....

iened operators adjusting belts too tightly and thus breaking them. The motor is ball-bearing equipped and has a dovetailed sliding base, including a gib with necessary locking screws. Adjustment is made by means of a hand-wheel and feed screw, making it easy to secure proper belt tension and accurate alignment of the motor. The spindle speeds can be changed easily and quickly by changing the motor pulley, using the same drive. The design of the machine makes it possible to change the belt without pulling the spindle through the bearing housings. By loosening four bolts on either side, the entire spindle assembly may be removed without pulling the spindle through the housings.

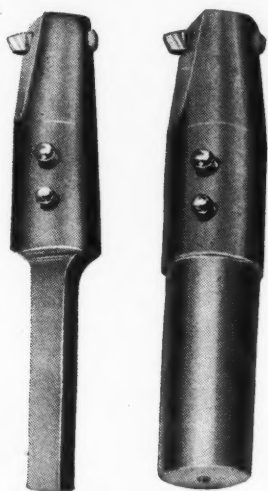
The extra large one-piece spindle is of nickel steel, with flat-top threads which afford a maximum of strength and durability. A safety wheel nut of Tobin bronze is used, which protects the threads. Two ball bearings of ample proportions are provided for each end of the spindle, although Timken bearings can be furnished upon request. The bearing boxes are keyed to the column, thus insuring accurate re-alignment after the housings have been disassembled. The pulley hood is removable and dustproof, and dust covers on each end of the bearing housings are provided with labyrinth seals which prevent dust and dirt from getting into the bearings. Texrope drive insures perfect power transmission without slippage.

Reliance Stainless Steel Lockwashers

Lockwashers made of stainless steel are now being marketed by the Reliance Manufacturing Co., Massillon, Ohio. This firm states that, in addition to having all the qualities of a non-corrosive stainless steel, washers made of this metal have a spring temper equal to that of the ordinary steel lockwasher. The steel is drawn by a special process by which it is finished to a degree of hardness—as indicated by Brinell test—sufficient to produce the stiffness and reactive pressure necessary in a lockwasher, making subsequent heat treatment unnecessary. This company is also in position to furnish the trade with stainless steel in coils or in straight lengths in any small section, either round, flat, square, or hexagon, from .022 in. to $\frac{1}{8}$ inch.

NEW

THE WEDGE-LOCK BORING TOOL



**FOR ENGINE OR
TURRET LATHES**

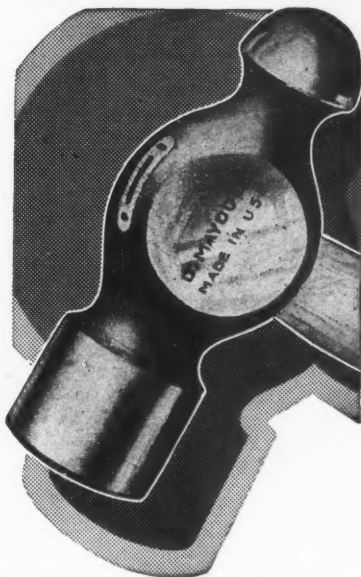
BUILT FOR BORING

Sold by Jobbers Everywhere

CIRCULAR UPON REQUEST

WEDGE-LOCK TOOL CO.

2523 N. Keeler Ave. CHICAGO



Built to fit your grip and swing

Try a Maydole, swing it, feel its remarkable hang, balanced to put all your power into the head, won't tire your arm.

The handle is carefully shaped to fit your hand from clear, second growth hickory that has been air dried for years, press-forged tool steel head put on "for keeps."

Built to stand hard use—for men who know tools and like to work with good ones. Your dealer carries them.

Please send a free copy of Pocket Handbook "P" containing much handy information and useful tables.

Name

Street

Town..... State.....

YOUR HAMMER SINCE 1843
Maydole
Hammers

The David Maydole Hammer Co., Norwich, NY

Baker-Case Machinist Chest

The Baker-Case Manufacturing Co., Inc., Sattley Bldg., Racine, Wis., is now



Baker-Case Machinist Chest

making four models of machinist chests, with or without till-top, as shown in the illustration, and in either 17 or 20-in. lengths. The case shown

is covered with a leatherette imitation of seal grain leather, but either style or length of case can be furnished in quartered oak, varnished to show the natural wood. All cases are 9 in. from front to rear and 12 in. high. The till-top model has a mirror in the top lid, and the front lid, which is self-hinged, automatically locks when it is swung to closing position. The case is of lock-cornered and glued construction with hand-fitted, felt-lined and steel-bottomed drawers, all nickel-plated hardware, and genuine leather handles with inner steel reinforcements. Steel drawer runners provide for smooth operation of the drawers, and the riveted nickel-plated drawer pulls cannot work loose.

Hopkins Air-Operated Arbor Press

The Tomkins-Johnson Company, Jackson, Michigan, has augmented its line by the addition of an air-operated arbor press which is available in 1,000, 4,000, 6,000 and 12,000 pound sizes. The press is of unusually rigid construction and can be furnished with controls arranged for either hand or foot operation. The col-

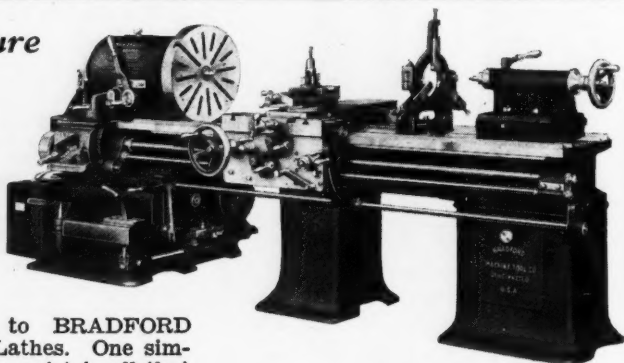
A New Feature

— FOR —

BRADFORD LATHES

The New "Kant-Slip" Quick Acting Apron Friction gives added convenience and greater flexibility to BRADFORD All-Geared Engine Lathes. One simple movement of the wrist is all that is required to engage or disengage either the length or cross feed mechanism in the apron.

All BRADFORD All-Geared Lathes are now equipped with the new



"Kant-Slip" quick acting Friction in apron.

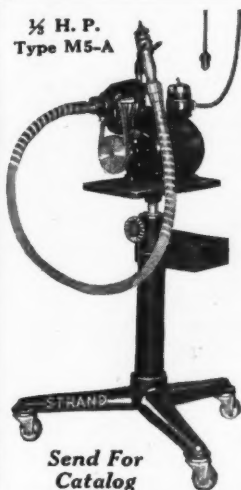
Send for details of this feature. Its added convenience and greater flexibility mean profits for you.

THE BRADFORD MACHINE TOOL CO.

659 EVANS STREET

CINCINNATI, OHIO

$\frac{1}{2}$ H. P.
Type M5-A



Strand

Full Ball Bearing Machine

$\frac{1}{2}$ H. P.

*Absolutely
the finest
machine
built*

—
We build sixty
types and
sizes of
flexible shaft
machines
—

*Send For
Catalog*

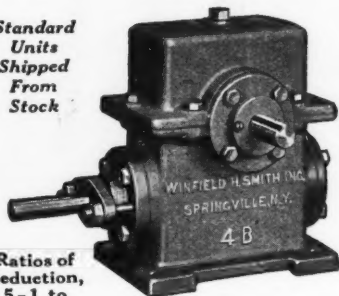
N. A. STRAND & CO.

5001 NORTH LINCOLN STREET
CHICAGO, ILLINOIS

W H S

Speed Reducers

*Standard
Units
Shipped
From
Stock*



*Ratios of
Reduction,
5-1 to
2500-1*

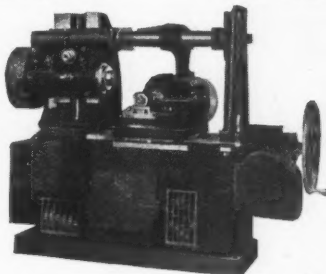
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Winfield H. Smith, Inc.

30 EATON ST.
SPRINGVILLE, ERIE CO., NEW YORK

SERVICE
is Our Motto

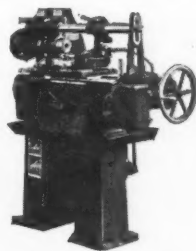
QUALITY
Our Creed



HOBGING MACHINES

by

**BARBER-
COLMAN**
of ROCKFORD



4 SIZES of Hobbing Machines . . .
two sizes "universal" type for spur
and spiral gears, sprockets, ratch-
ets, splined shafts and other hobbled
forms . . . two sizes for high produc-
tion on spur gears and splined shafts
only . . . Quality Products . . . Send
for our circulars.

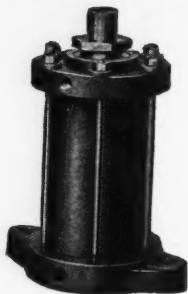
**BARBER-COLMAN
COMPANY**

General Offices and Plant, Rockford, Ill., U.S.A.

"HOPKINS"
PREFERRED
EQUIPMENT

Non-Rotating
Double-Acting
Air Cylinders

...A Production Tool Worthy of Its Job!



Number 4

ENGINEERED and built to do a speedy, efficient job—HOPKINS Air Cylinders keep in step with high-gear production schedules. They give you the utmost in machine control operation.

Available in any capacity; they save labor, time and lost motion. Modern, economical, efficient—lower costs result as a matter of course.

Ask for descriptive literature, prices on numbers 1, 2, 3 and 4.

We also manufacture HOPKINS series B and C Air Cylinders and 2- and 3-jaw chucks.

TOMKINS-JOHNSON CO.
JACKSON, MICHIGAN

-----COUPON-----

THE TOMKINS-JOHNSON CO.
JACKSON, MICHIGAN

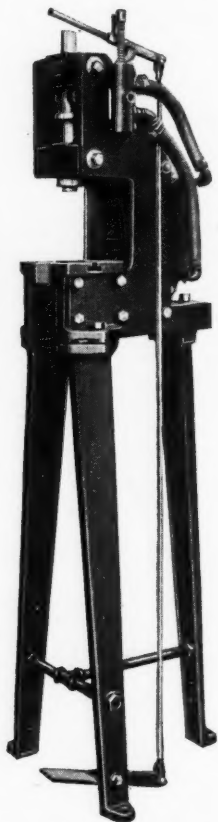
- () Send Representative
() Send Cylinder Circular

Name

Address

City..... State.....

umn of the press is built of heavy steel plates. Two bearings are provided for the ram, insuring that it will work up and down in a vertical position. Punches or assembling tools locate in a hole in the end of the ram, where they are held by set screws. Tools can also be bolted to the table, as desired, a T-slot



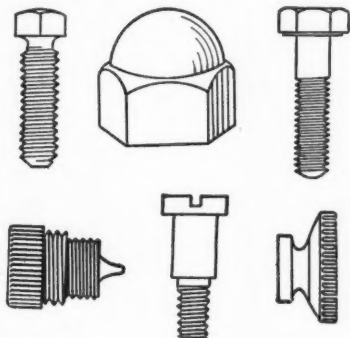
Hopkins Air-Operated Arbor Press,
1,000-Lb. Size

being provided for locating purposes. The adjustment of the ram is obtained by means of a "U" washer of suitable thickness, which eliminates the cutting of a thread on the ram for adjustment purposes. Pull is transmitted from the base casting in such a way that no fulcrum is necessary on the side plates. The press is operated by the Hopkins

Western Screw-Products Co.

Screw Machine Products
Hex. Head Cap Screws

SET SCREWS CASTLE NUTS



1931 St. George St., St. Louis, U.S.A.

For Lapping Tungsten Carbide Tools

YOU can lap your tungsten carbide tools quickly and efficiently with this horizontal 15" disc grinder, equipped with a special iron disc. The disc is charged with diamond dust and oil or other lapping compounds.

Also Type D-2, with table and gauge for angle lapping.

Increase the life of your tools—ask us how.



Type D-3 Disc Grinder

THE PORTER-CABLE MACHINE CO.
300 Wolf Street Syracuse, New York

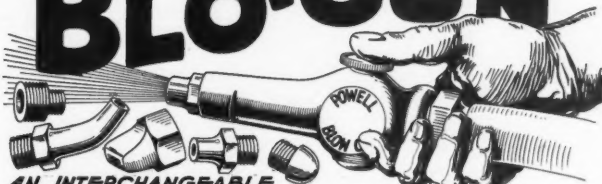
PORTER-CABLE
GRINDERS

(85

**LET A POWELL BLOW GUN
AIR VALVE—**

Blow your Turnings or Borings away

BLO-GUN



**AN INTERCHANGEABLE
NOZZLE TIP FOR EVERY PURPOSE—**



POWELL VALVES



THE WM. POWELL CO., Cincinnati, Ohio

Tubular-Type Air Cylinder, which may be changed as desired to increase or decrease the pressure.

Bonney 1930 Catalog

The Bonney Forge & Tool Works, Allentown, Penna., has brought out a new catalog of the Bonney 'CV' Chrome Vanadium Wrenches. The book contains 44 pages, being made up of 22 loose-leaf sheets, each 8½ x 11 inches. Wrenches for all standard and special purposes are described and illustrated, including engineers' wrenches, tappet wrenches, ignition set wrenches, brake wrenches, box wrenches, socket wrenches, special aircraft wrenches, Stillson wrenches, and so on. Sets of wrenches are also listed, made up on display racks for counter use or put up in leather kits.

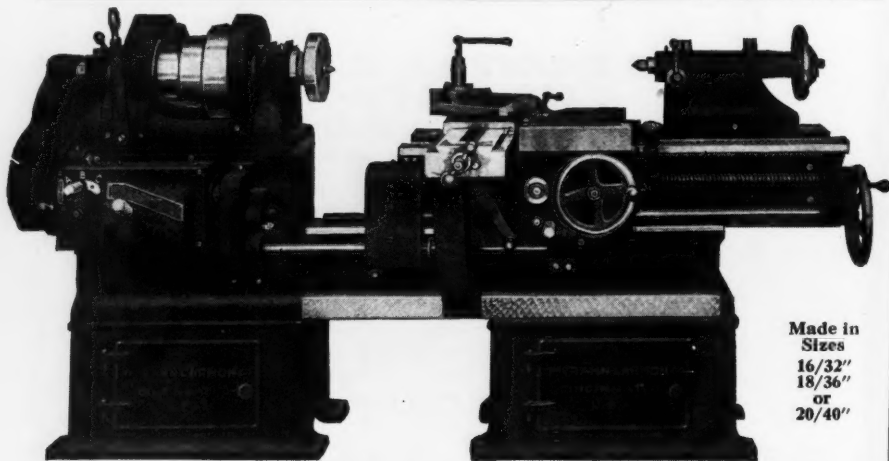
Apex Large Size Friction Chuck

The Apex Machine Co., 302 Davis Ave., Dayton, Ohio, has augmented its line by the addition of a larger size of Safety Friction Chuck for tapping or nut-setting. The chuck is of the same



Apex Friction Chuck

patented design as the other Apex Friction Chucks with the exception that it has a tap capacity of from 1½ in. to 3 in. The taps are held in the chuck by means of free floating tap collets which permit the tap to follow the hole, both tap and collet being driven by the square. Hand taps are used with this chuck. The tool is intended to meet the demand for a friction chuck for use in tapping large size bottom holes in one operation and for setting corresponding size studs and nuts in the building of heavy machinery. The body of the chuck is 5 in. diameter by 7½ in. long and may be furnished with either No. 5 or No. 6 Morse



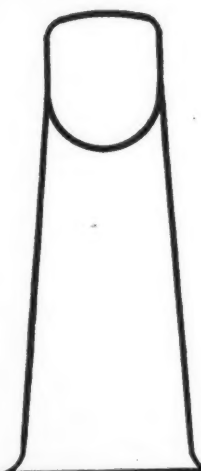
Made in
Sizes
16/32"
18/36"
or
20/40"

Rahn-Larmon 18/36" Extension Bed Gap Lathe

A lathe for large or small swing work, ready at all times. Requires no extra rigging up. Takes different distances between centers.

Belt driven or with nine speed all geared motor driven head. Tell us what your requirements are and let us quote you.

THE RAHN-LARMON CO. 2935 Spring Grove Ave., Cincinnati, Ohio



A NEW and larger size adjustable friction chuck for tapping and stud setting.

1" to 3" capacity

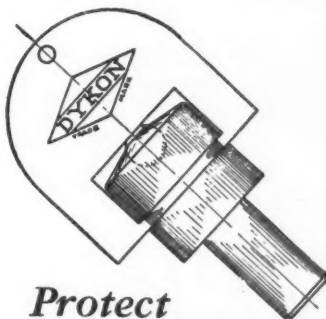
Being used by manufacturers of heavy machinery such as gas and Diesel engines, large compressors, oil stills, locomotives, railroads, etc.

No. 5 or 6 M. T. Shank
Body diameter, 5".
Body length, 7¼".

**WRITE FOR
FULL DETAILS.**

APEX
The APEX MACHINE CO.
302 Davis Ave., Dayton, O.

DYKON GAGES



Protect

Koebel-Wagner DIAMONDS!

KOEBEL-WAGNER Diamonds are protected by the Dykon Gage against unintentional abuse. This is a small KOEBEL-WAGNER Device which indicates almost automatically when a diamond is worn to its lowest level and requires resetting.

KOEBEL-WAGNER Diamonds are also protected by a Safety-mounting against loss. This mounting prevents the stone being torn loose by the action of the grinding wheel.

Thousands of these diamonds are used daily throughout the manufacturing industry to keep precision grinding wheels smooth and true. They will cut your grinding costs and give your grinding wheels longer life. Let us show you how—send the coupon TODAY!

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Logan Catalog S-25

Catalog "S-25," illustrating and describing the various types and sizes of air-operated chucks, rotating and non-rotating cylinders, control valves, arbor presses, and other air-operated devices produced by The Logansport Machine Co., Logansport, Indiana, has been issued by this firm. The catalog contains 64 pages of useful information, sectional drawings, engineering dimensions, and descriptions of recent improvements in air-operated mechanisms. Copy free upon request.

Campbell Nibbling Machine Catalog

A catalog describing the complete line of Campbell Nibbling machines has been issued by A. C. Campbell, Inc., Bridgeport, Conn. The catalog gives detailed instructions as to the operation of the machine, and shows how sheet metal shapes, templates or patterns can be cut on the nibbling machine in a minimum of time. Copies can be obtained without charge by addressing the firm mentioned.

Swiss Jig Borer Catalog

A catalog describing and illustrating the new models 4B and 5B Swiss Jig Borers can now be obtained from The R. Y. Ferner Co., 1511 K Street, N. W., Washington, D. C. All the various parts of the machines are illustrated in detail, with directions for operating and showing different kinds of operations to which the machine may be adapted. Complete specifications are included.

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**Grooved
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4	1 1 1/4 1 1/2
5	1 1/4 1 1/2 1 3/4
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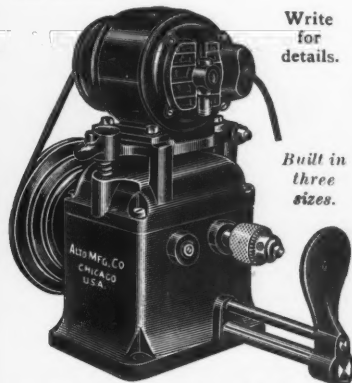
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is a convenient three speed tapping unit with ample power to drive a $\frac{3}{8}$ " tap through cold rolled steel. However, small taps can be driven at high speeds in perfect safety. Result—your production increases.



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THREE SIZES
Jaws 6", 9" and 12" Long



Fig. 2. Without
Jig Attachments

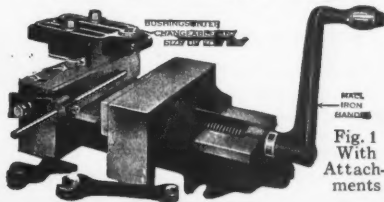
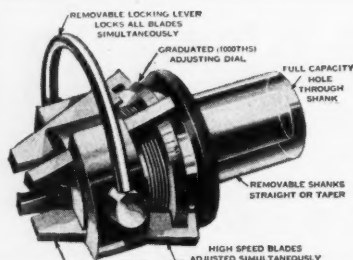


Fig. 1
With
Attachments

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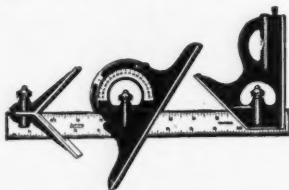
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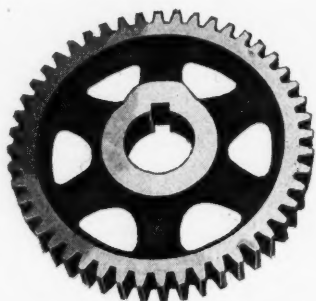


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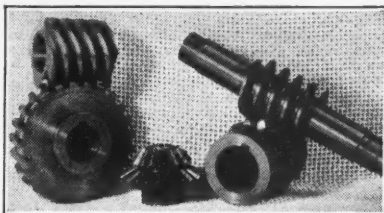
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Boeing Airplanes

(Continued from page 28)

the motor ring, as shown in Fig. 11, and the bosses are surfaced with the grinding wheel.

The attachment consists of a heavy steel base which carries a small portable grinder, the grinder being carried on a shaft through the center of the base. The base is held in place on the motor ring by pins in each of the four arms, which slip into the ring. A feed screw is provided for the motor, and a counterbalance keeps the weight distributed. A handle which is attached to the motor provides for revolving the grinder while the wheel is running. The operation takes but a few minutes, and assures a solid mounting for the motor.

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Abrasive Grinding Wheels: The types of wheels, with recommended grades and grains, which should be used for each of the various kinds of grinds are discussed in a booklet which will be sent free to mechanical executives by the Abrasive Company, Philadelphia, Pa.

Hollow-Milling: How production can be increased and costs lowered by the use of adjustable hollow-mills with high speed blades and interchangeable shanks is told in a bulletin that has been issued by Ogden R. Adams, 407 Cutler Bldg., Rochester, N. Y. Copy free upon request.

Aetna Thrust Ball Bearings: Catalog No. 8, published by the Aetna Ball Bearing Manfg. Co., 4610 Schubert Ave., Chicago, Ill., contains complete descriptions and illustrations of the thrust ball retainers made by this firm. Copy free upon request.

High Speed Tapping: The various types of Alto Motor-Driven, High Speed, Self-Contained Tapping Machines are described and illustrated in a series of folders that have been issued by The Alto Manufacturing Co., 1648-52 Wolfram St., Chicago, Ill. Free upon request.

Breaching By Modern Methods: Equipment and tools for finishing round, square or irregular-shaped holes and surfaces by broaching are described and illustrated in a booklet that is issued free by the American Broach & Machine Co., Ann Arbor, Michigan.

Ames Dial Gages: The latest types of dial gages for inspection purposes are described in the Ames No. 55 Bulletin, which will be sent free to any machine shop executive. Address B. C. Ames Co., Waltham, Mass.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free upon request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine Co., 200 Davis Ave., Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 323 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Metal and Wood Saws: Catalog No. 20 describing saws of all kinds, for both metal and wood. 256 pages of descriptions of saws and sawing machinery. E. C. Atkins & Co., 402 S. Illinois St., Indianapolis, Ind.

Hold Odd-Shaped Pieces Securely: A vise in which odd-shaped work can be held securely without the need of special jaws or fixtures is described in a folder that has been issued by The Avey Drilling Machine Co., P. O. Box 487, Cincinnati, Ohio. Copy free upon request.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free upon request.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-oiling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1808 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

"C-V" Chrome Vanadium Wrenches: A complete line of wrenches made of Chrome Vanadium steel—practically unbreakable—is described in a booklet that has been issued by the Bonney Forge & Tool Works, Allentown, Pa. Copy free upon request.

Bradford Precision Lathes: Precision Lathes for the tool room and for general manufacturing purposes, all-geared and cone types, belt or motor driven, are described and illustrated in a catalog that is issued by The Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio. The catalog also includes descriptions of taper, relieving, turret and other lathe attachments. Sent free upon request.

How To Sharpen Staggered Tooth Cutters, Helical Milling Cutters, and Two-Lipped End Mills: A series of pamphlets on these subjects can be obtained without charge by addressing the Brown & Sharpe Mfg. Co., Providence, R. I.

Sheet Metal Problems: The use of the nibbling machine for cutting sheet metal stock is discussed in a booklet which can be had without charge by addressing Andrew C. Campbell, Inc., Bridgeport, Conn.

High Speed Drill Presses: A complete line of drill presses that can be run at high speeds with complete safety is described in catalog number 50, issued by the Caneby-Otto Manufacturing Company, Chicago Heights, Ill. This catalog also contains descriptions of other equipment manufactured by this concern. Sent free upon request.

Boring Tool With Micrometer Adjustment: A circular describing and illustrating the Palmgren Off-Set Boring Tool, which is adaptable for either tool or production work, can be had by addressing the Chicago Tool and Engineering Co., 84th St. and So. Chicago Ave., Chicago, Ill.

Gear Data: The Cincinnati Gear Co., Cincinnati, Ohio, has published Catalog D, which describes and illustrates the various types and kinds of gears made by this firm. The book contains photographs of the plant departments, with descriptions of the equipment employed, and also includes a number of pages of valuable data and reference tables for machine shop use.

Grinding the Centerless Way: The advantages of the centerless grinding method is discussed in a booklet which also describes the centerless grinding machines made by Cincinnati Grinders, Inc., Cincinnati, Ohio. The illustrations show various types of jobs in process, and full data is included. Copy free upon request.

Cincinnati Hydromatics With Locked Hydraulic Feed is the title of a book that describes in detail the new type of automatic milling machine with hydraulic feed which has been developed by The Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio. Copy free to any machine shop executive.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Bolender Gear Burnishers: Gears will operate more smoothly and more silently if burnished. Full description of the Bolender Gear Burnisher can be had by addressing the City Machine & Tool Works, Third and June Sts., Dayton, Ohio.

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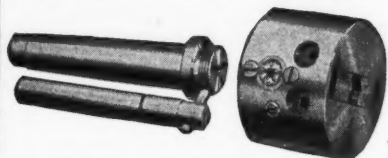
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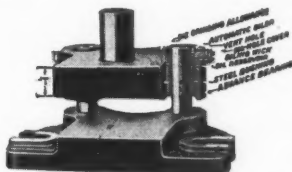
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Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

Columbia Superior Shapers: Bulletin No. 17, issued by The Columbia Machine Tool Co., Hamilton, Ohio, describes and illustrates the line of heavy duty shapers made by this firm. Copy free upon request.

Columbia Tool Steel Handbook: A book containing valuable information concerning the making of tools, heat treating, uses of hardness testing instruments, uses of the quenching bath, drawing bath, and other heat treating equipment, and together with tables and other useful information can be obtained without charge by addressing the Columbia Tool Steel Co., 550 E. 14th St., Chicago Heights, Ill.

Broaching for Profit: A combination round and spline broach which broaches the drilled hole to size, cuts the splines, and removes the burrs in one operation is described in a circular which will be sent free by The Connecticut Broach & Machine Co., New London, Conn.

Dia Makers' Supplies: A complete line of die sets, leader pins, bushings, and other die makers' supplies are described in a book that is issued by the Danly Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

Davis Keyseaters: Recent developments in keyseating methods are discussed in a bulletin that also describes the keyseaters made by the Davis Keyseater Company, 250 Mill St., Rochester, N. Y. Copy free upon request.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Precision Grinding: A booklet which describes and illustrates the most modern methods of performing all kinds of precision grinding operations, showing how the Dumore grinder can be applied to various kinds of machine tools, has been published by The Dumore Company, Racine, Wis. Copy free upon request.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Grooved Cast Iron Pulleys: All sizes of grooved cast iron pulleys, made by Efficient Machine Shop, 147 Baxter St., New York City, are listed in a circular that can be had by writing this firm.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

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Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and

Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

Gear Problems: Catalog No. 203, published by the Foote Bros. Gear & Machine Company, Dept. 68, 111 No. Canal St., Chicago, Ill., is intended to serve as a complete reference work for all users of gears or speed reducers. Full instructions for figuring gears, sprockets, chains, etc., are included. Copy free to any mechanical executive.

Modern Grinding Equipment: The complete line of universal tool and cutter grinders, surface grinders, drill grinders, tap grinders, and other grinding machines made by the Galmeyer & Livingston Co., 336 Straight St., S. W., Grand Rapids, Michigan, is described in a series of bulletins that have been issued by this firm. Free upon request.

Adjustable Blade Cutters: Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the Genesee Manufacturing Co., 141 N. Water St., Rochester, N. Y.

Machine Vises of all sizes for use with machine shop equipment are described in a circular that will be sent free upon application to The Graham Mfg. Co., 69 Willard Ave., Providence, R. I.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Swiss Files: The complete line of Grobet Swiss Files for use in die and tool work or for other fine work is described and illustrated in Catalog "K," published by the Grobet File Corporation of America, 3 Park Place, New York, N. Y. Copy free upon request.

Drawing Tables: The Hamilton steel-base, adjustable drawing table is described in Catalog No. 7-MS, issued by the Hamilton Mfg. Co., Two Rivers, Wis. Copy free upon request.

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Universal Drill Jig: The John's Universal Drill Jig can be used for drilling, centering, milling, reaming, tapping, and other operations with slight changes. Descriptive circular can be had by addressing the Heuser Manufacturing Co., 1638 N. Paulina St., Chicago, Ill.

Drilling and Grinding Electrically: Catalog M, showing and describing a variety of modern electric portable drills, grinders, and other tools, including floor grinders and buffers, has been issued by The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, Ohio.

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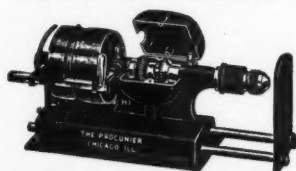
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"Excel" Precision Filing and Sawing Machine: A filing and sawing machine for use in producing templates, dies and other irregular-shaped parts is described and illustrated in a booklet which is issued free by Index Machinery Corporation, 49 Central Ave., Cincinnati, Ohio.

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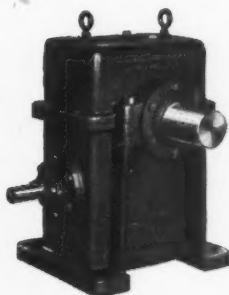
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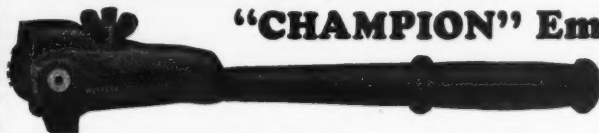
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Drill Around Corners: Holes can be drilled in close quarters by the use of the Kozza Right Angle Drill. Can also be used for keywaying or countersinking. A descriptive pamphlet can be had by addressing Chas. A. Kozza, 464 Augustine St., Rochester, N. Y.

Lathe Dogs and C Clamps are described and illustrated in Catalog No. 80, issued by the W. G. LeCount Tool Works, South Norwalk, Conn. Copy free upon request.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Punching and Shearing Operations: A complete line of machines for perforating and cutting metal in practically any size and shape is described and illustrated in a booklet which has been issued by The Long & Allstatter Co., Hamilton, Ohio. Copy free upon request.

Rapid-Reading Micrometer: A new type of rapid-reading micrometer, designed to show the reading in numerals, is described in Catalog No. 5, issued by The Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

Finish Irregular Surfaces the Modern Way: Irregular surfaces in dies, patterns, tools and other parts where the use of a file is difficult and laborious can now be finished quickly and neatly by the use of the Kipp Air Grinder. Catalog and prices upon request. Address Madison-Kipp Corporation, 219 Waubesa St., Madison, Wis.

"A Captain of Industry": Pocket Handbook 23-P, issued by The David Maydole Hammer Co., Norwich, N. Y., tells how David Maydole came to make what he considered the best hammer in the world, and also includes descriptions of the various types of Maydole hammers. Several useful tables are included. Copy free upon request.

Gears: Quick service on gears in either standard or special sizes is available from the Massachusetts Gear & Tool Co., 27 Nashua St., Woburn, Mass. Particulars upon request.

Time Saving Machine Equipment: How machining time can be reduced to the minimum by the use of Wizard chucks, collets and tap holders, turret-tool posts, self-centering steadyrests, and other McCroskey equipment is told in a book that is issued by the McCroskey Tool Corporation, Meadville, Penna. Will be sent without charge.

Midwest Pin Drive Keyway Cutters are described and illustrated in a catalog that can be had by addressing Midwest Tool & Mfg. Co., 2362 West Jefferson Ave., Detroit, Michigan.

Polish at Any Speed: The Mitchell motor-driven polishing lathe, in which herringbone gears are used to transmit power from the motor shaft to the lathe spindle, can be operated at any desired speed. Bulletin can be obtained by addressing the Mitchell Engineering Co., Springfield, Ohio.

Nateo Drilling, Tapping, and Boring Equipment is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Nateo" multiple drilling and tapping machines.

Milling Internal Keyways: A simple method of milling keyways in gears, wheel hubs, and other similar parts with the aid of a drill press and a special tool is explained in a booklet that is published by the National Machine Tool Co., 2271 Spring Grove Ave., Cincinnati, Ohio.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co.,

Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Save Time with Expanding Mandrels: How expanding mandrels will solve the problem of turning pieces with odd-size holes, and will increase production on duplicate work, is told in a folder that will be sent free upon request by W. H. Nicholson & Son, 136 Oregon St., Wilkes-Barre, Pa.

Live Centers: The complete line of live centers manufactured by Nielsen, Inc., of Lawton, Mich., are fully described in a bulletin issued by this company. This bulletin is illustrated with photographs and blueprints of the Nielsen Center. Mailed free upon request.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

How To Grind Cemented Tungsten Carbide: A booklet which describes and illustrates the correct methods of grinding tungsten carbide tools has been published by the Norton Company, Worcester, Mass. Copy free upon request.

Speed Reducers: Speed Reducers to obtain any desired reduction up to 24,000 to 1 are described and illustrated in Catalog 29-A, issued by The Ohio Gear Co., 1335 East 179th St., Cleveland, O. Copy free upon request.

Die Making Machines: How dies, templates, gages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines is fully described in a bulletin issued by the Oliver Instrument Company, 1430 Maumee Street, Adrian, Mich. Mailed upon request.

Self-Tapping Sheet Metal Screws: Screws which are threaded and hardened in such a manner as to enable them to cut their own threads as they are screwed into sheet metal assemblies are described in a folder which is published by the Parker-Kalon Corporation, 192-196 Varick St., New York City, N. Y. Sent free upon request.

"Turning With Tungsten Carbide" is the name of a book that has been issued by The Porter-Cable Machine Co., 300 Wolf St., Syracuse, N. Y. This book answers the most important questions as to the uses of this new cutting alloy, and also describes a new lathe which has been developed especially for use with tungsten carbide tools. Copy free upon application.

Powell "Bio-Gun" Air Valves: Air is faster and more efficient than a brush for cleaning machine tables. The use of the Powell Bio-Gun for this purpose is discussed in a catalog that can be obtained by addressing The Wm. Powell Co., Cincinnati, O.

Tapping Devices, Quick-Change Chucks, Stud-Setting Tools and Bench Tappers: A catalog describing the various types and kinds of tapping, drilling, and stud-setting devices manufactured by the Procnier Safety Chuck Company, 12 South Clinton Street, Chicago, Ill., can be obtained without charge by addressing this company. The catalog also tells the part that Procnier tools play in obtaining greater accuracy and less tap breakage.

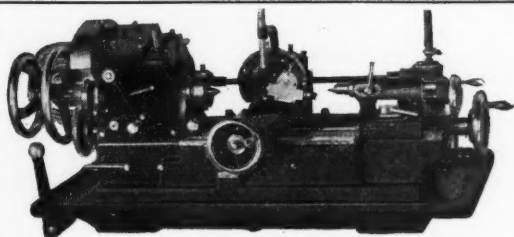
Engine, Turret, and Gap Lathes are described in a series of bulletins that have been issued by The Rah-Larmon Co., 2935 Spring Grove Ave., Cincinnati, Ohio.

Lift By Electricity: Ways to eliminate lifting, carrying and hand trucking by the use of the Reading "Everedy" single-drum, self-braking electric hoist are discussed in a booklet that can be obtained free from Reading Chain & Block Corp., Reading, Penna.

Shape or Slot With This Machine: The Rhodes Convertible Shaper, made by The Rhodes Manfg. Co., Waltham, Mass., can be used for horizontal shaping or vertical slotting. Details upon request.

Pullmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Universal Openside Shaper-Planer: The need of a machine tool to fill the gap between the shaper and the



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Horizontal Shaper and Vertical Slotter because it provides a better means of handling a great number of small jobs ordinarily assigned to larger machines. Moreover, it is a precision tool designed to produce accurate results.

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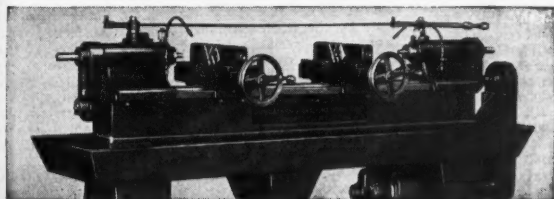


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ANN ARBOR, MICHIGAN



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Rockford, Illinois

planer has been filled by the development of the Rockford Universal Openside Shaper-Planer, made by the Rockford Machine Tool Co., 2414 Klahawake Ave., Rockford, Ill. Full description on request.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Safety Grinding Wheels: The complete line of grinding wheels made by the Safety Grinding Wheel & Machine Co., Springfield, Ohio, is described in Catalog No. 11, which is issued by this firm. The book also contains instructions for operating grinding wheels, tables of grinding wheel speeds, pulley calculations, and other information for the user of grinding wheels.

Saving Time With Small Tools: A line of time-saving small tools, including "Use-Em-Up" drill sleeve, "Wear-ever" chucks, collets, cutters, reamers and tap holders, counterbores, spotfacers, and other tools is described in Catalog 36, issued by Scully-Jones & Co., 1909 S. Rockwell St., Chicago, Ill.

Equipment for the Shop: Vises for the bench, drill press, milling machine or shaper; angle plates; adjustable clamps, jacks and other tools for the machine shop, are described and illustrated in a booklet that is published by the Sheldon Machine Co., 3253-55 Cottage Grove Ave., Chicago, Ill. Copy free upon request.

Economies in Material Handling: A volume of facts about planned load handling, with actual examples of economies in time, material, and labor costs that have been effected with Shepard electric hoists will be sent free upon request to Shepard Niles Crane & Hoist Corp., 424 Schuyler Ave., Montour Falls, N. Y.

Rapid Drill Jigs: How time can be saved and drilling operations made easier by the use of a quick-acting drill jig is told in a booklet that is issued free by the Siewek Tool & Die Co., 10230 Woodward Ave., Detroit, Michigan.

"Metal Cutting" is the title of the book that describes the latest methods of cutting metals, and includes descriptions and illustrations of both the band saws and inserted-tooth metal-cutting saws made by the Simonds Saws & Steel Co., Fitchburg, Mass. Copy will be sent free upon application to the firm mentioned.

The Most Efficient Speed for the operation of special production units, power conveyors, and other machinery by the use of the WBS Speed Reducer and how it can be obtained is told in a bulletin that will be mailed free by Winfield H. Smith, Inc., 30 Eaton St., Springfield, N. Y.

Shaping with Modern Equipment: The Smith & Mills Company, 2889-91 Spring Grove Avenue, Cincinnati, Ohio, has issued a booklet which describes and illustrates the line of modern shaping equipment made by this firm. Copy free upon request.

Accurate Gages Speed Production: The complete line of snap, plug, ring, pin, dial indicator, and special gages made by the Standard Gage Co., Inc., Poughkeepsie, N. Y., is described and illustrated in Catalog No. 4, which can be had without charge by addressing this firm. Johansson gage block sets and accessories are also listed in this book.

Machinists' Tools and Gages: Catalog No. 24, issued by the L. S. Starrett Co., Athol, Mass., describes and illustrates the complete assortment of machinists' fine tools and gages made by this firm. Copy free upon request.

Flexible Shaft Equipment: The uses of the flexible shaft for drilling, grinding, and other operations is discussed in a booklet which also describes and illustrates the flexible shaft equipment made by N. A. Strand & Co., 5001 N. Lincoln St., Chicago, Ill.

Cutting Oil Data: A series of booklets containing valuable information about cutting oils and their uses for thread-cutting, broaching, and general cutting purposes will be sent free to any mechanical executive by D. A. Stuart & Co., 2727 South Troy St., Chicago, Illinois.

Cutting and Grinding Facts: A discussion of cutting oils and lubricants, together with descriptions and illustrations of various kinds of jobs upon which cutting oils are used, is contained in a booklet that is issued by the

Sun Oil Company, Finance Building, Pittsburgh, Pa. Free upon request.

Precision Measuring Instruments: The gages, micrometers, and other precision measuring instruments made by the Swedish Gage Co. of America, 7310 Woodward Ave., Detroit, Mich., are fully described in an interesting booklet that has been published by this firm. Copy free upon request.

Chuck With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

Powerful, Easy-Acting Chain Hoists of the most modern design are described and illustrated in a booklet that is issued by the Union Manufacturing Co., 296 Church St., New Britain, Conn. Copy free upon request.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 24, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Accuracy in Thread Production: How accurate threads can be produced by the thread miller is told in a pamphlet that can be obtained free by addressing the Waltham Machine Works, Box 296, Waltham, Mass.

Tool Chests for Machinists and Toolmakers: The complete line of fine tool chests for machinists and toolmakers made by J. M. Waterston, 420 Woodward Ave., Detroit, Mich., is described in Catalog No. 25. Ask for it.

"Wedge-Lock" Multiple Bit Tool Holder: A new type of tool holder, in which the tool bit is held by the action of a wedge, is described in a bulletin which will be sent free upon request by the Wedge-Lock Tool Co., 2521 N. Keeler Ave., Chicago, Ill.

Screw Machine Products: Full information as to the manufacturing service on screw machine products maintained by Western Screw Products Co., 19-31 St. George St., St. Louis, Mo., will be sent upon request.

Shop Furniture: A catalog describing and illustrating all kinds of shop furniture, including benches, vices, steel stands, foremen's desks, chip trucks, steel racks for bar stock, steel tote boxes, and other equipment will be sent free upon application to The Western Tool & Manufacturing Co., 1620 East Pleasant Street, Springfield, Ohio.

Wetmore Adjustable Reamers: The exclusive features of the Wetmore Adjustable Shell Reamer are discussed in Catalog No. 29, issued by the Wetmore Reamer Co., 62 27th St., Milwaukee, Wis. Copy free upon request.

Drill Horizontally: The advantages of the "Whirlwind" Horizontal Drilling Machine for high speed drilling on small work are discussed in a bulletin which has been issued by Whirlwind Products Co., 1737 Ludlow St., Indianapolis, Ind. Copy free upon request.

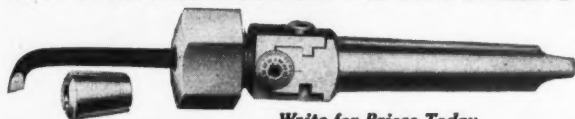
Whitton Steel Body Lathe Chucks: The various types and sizes of steel body chucks for lathes that are made by the D. E. Whitton Machine Co., New London, Conn., are described and illustrated in a booklet that will be sent free upon application to this firm.

Wrenches For Every Use: "Guaranteed Against Breakage" tapset wrenches, pipe and fitting tongs, offset wrenches, and wrenches for all other uses are described and illustrated in a series of folders which can be obtained without charge by addressing J. H. Williams & Co., Buffalo, N. Y.

"An Inspection Tour of Industrial Plants" is a booklet published by Wilson-Maeulen Co., Inc., Concord Ave. & 143rd St., New York, N. Y., showing the heat-treating equipment in use in a number of industrial plants, and discussing the manner in which such equipment is automatically controlled. Copy free upon request.

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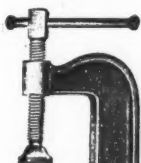
That's what the head toolmaker of the Seneca Camera Mfg. Co. says about the OLIVER Die Making Machine. On all sawing, filing and lapping operations the OLIVER will quickly save its modest cost. **YOU SHOULD OWN ONE.**

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Seven sizes, 3
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13/16" screw.
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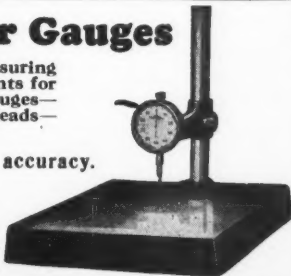
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THE SCRAP PILE

By GEO. ALEXANDER MANN



What the average doctor don't know would fill a hospital.

Couldn't You Kill Him?

Of spiffy cracks—

He's only got two—

One is "Oh yeah?"—

The other "sez you."

The average flapperette is like a Baby Ruth—sweet but nutty.

It's usually the guy who spends his life looking for an opening who finds himself in the hole.

One o' the best we've heard lately is 'bout the junk social given by one o' the Hyde Park churches—the ladies were requested to bring anything they were about ready to discard as useless an' four of 'em brought their husbands.

Why—Bill

"There's a rainbow 'roun' my shoulder—"

Sang Myrt to Billy Charm,
Bill said, "That's no rainbow,
Shucks, that's jes' my arm."

Goodness—Horace

For poor nut Horace,

There is no hope—

They gave the bride a shower,
An' he brought soap.

When a man starts counting himself out nobody is going to save him by a ring of the bell!

An' That's Enuuf

'Bout all men know about wimmin's clothes is the price.

Some Liar

Bill's himself to the last,
He's game to the core,
They say that Bill's lyin'
At death's door.

A few more increases in the sizes o' the buses an' the trains'll have to do the stoppin' at the crossin's.

What A Wow He Is

"Germs in kissin'?"

Aw come to terms—

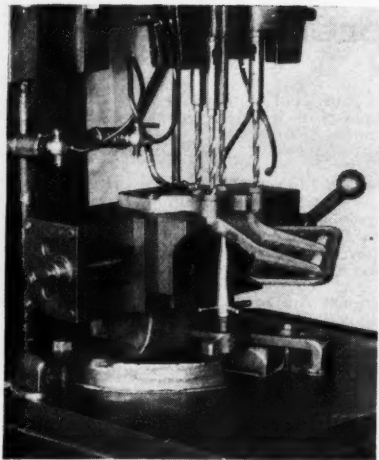
I kiss so hard

I kill the germs.

No telephone company "wrong numbers" are wronger than the ones in the rates.

This is 'bout the time o' year that Friend Husband feels like taking the silk smoking jacket he got for Christmas to the office with him for fear he'll get home an' find Friend Wuff has cut it up for cushion covers.

Jun
Chic
14" J
they
oper
But,
crea
lowe
Univ
tool
on d
other
Send
fold
"JOE
incre
your
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**"Increased production
50%
on drilling operations"**

... is what the head of a large Chicago concern writes us about the 14" JOHN'S Universal Drill Jig which they are using on certain drilling operations.

But, you've got a right to expect increased production . . . and even lower tool costs . . . with a JOHN'S Universal Drill Jig because it is a tool that can be kept in constant use on drilling, milling, centering, and other similar operations.

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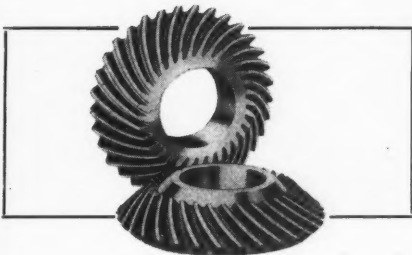
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When you need a *good gear* to meet your strictest requirements or specifications . . . you need a CINCINNATI GEAR.

Made by gear specialists with modern equipment, all CINCINNATI GEARS are accurate in size, true in form and correct in pitch. Try them!

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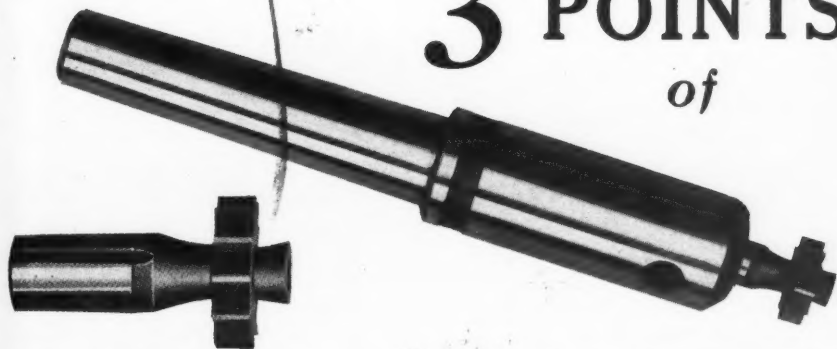
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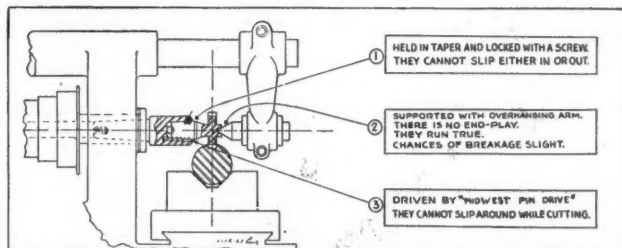
Index to Advertisements

	Page		Page
Abrasive Company, The.....	60	LeCount Tool Works, W. G.....	111
Acme Machine Tool Company, The.....	78	Logansport Machine Company.....	24
Adams, Ogden R.....	102	Long & Allstatter Company, The.....	77
Aetna Ball Bearing Mfg. Co.....	107	Lufkin Rule Co., The.....	102
Alto Mfg. Co.....	101		
American Broach & Machine Co., The.....	109	Madison-Kipp Corp.	27
Ames Company, B. C.....	111	McCrosky Tool Corporation.....	2
Anderson Bros. Mfg. Co.....	105	Maydole Hammer Co., The David.....	93
Angle Steel Stool Company.....	43	Massachusetts Gear Co.....	103
Apex Machine Company, The.....	99	Midwest Tool & Mfg. Co.....	114
Armstrong Bros. Tool Co.....	10	Mitchell Engineering Co., The.....	68
Atkins and Company, Inc., E. C.....	45		
Avey Drilling Machine Co.....	29	National Automatic Tool Co., The.....	39
		National Machine Tool Co., Cincinnati, Ohio	86
Barber-Colman Company	95	National Tool Company.....	8
Barnes Co., W. F. & John.....	65	Nicholson & Co., W. H.....	101
Barnes Drill Co.....	6	Nielsen, Inc.	81
Baumbach Mfg. Co., E. A.....	105	Norma-Hoffmann Bearings Corporation....	51
Bonney Forge & Tool Works.....	Third Cover	Norton Company.....	Front Cover
Bradford Machine Tool Co.....	94		
Brown & Sharpe Mfg. Co.....	5	Ohio Gear Co., The.....	102
		Oliver Instrument Company.....	111
Campbell, Andrew C., Inc.....	75		
Canedy-Otto Manufacturing Co.....	71	Parker-Kalon Corporation	52
Chicago Tool & Engineering Co.....	111	Porter-Cable Machine Company.....	97
Cincinnati Gear Co., The.....	113	Powell Co., The Wm.....	97
Cincinnati Grinders Incorporated.....	4	Procuier Safety Chuck Co.....	107
Cincinnati Milling Machine Co., The.....	18, 19		
Cincinnati Planer Co., The.....	49	Rahn-Larmon Co., The.....	98
City Machine & Tool Works.....	85	Reading Chain & Block Corp.....	67
Cleveland Twist Drill Co., The.....	116	Rhodes Manufacturing Co., The.....	109
Columbia Machine Tool Co., The.....	87	Rockford Drilling Machine Co.....	91
Columbia Tool Steel Co.....	101	Rockford Machine Tool Company.....	89
Connecticut Broach & Machine Co.....	79	Ruthman Machinery Co., The.....	76
Danly Machine Specialties, Inc.....	Second Cover	Safety Grinding Wheel & Machine Co., The	31
Davis Keyseater Company.....	89	Scully-Jones & Co.....	25
Desmond-Stephan Mfg. Co., The.....	102	Sheldon Machine Company.....	36
Dumore Company, The.....	63	Shepard Niles Crane & Hoist Corp.....	6
Eclipse Counterbore Company.....	74	Siewek Tool Company.....	91
Efficient Machine Shop.....	100	Simonds Saw & Steel Co.....	57, 58, 59
		Smith & Mills Co., The.....	77
Federal Products Corporation.....	83	Smith, Winfield H., Inc.....	95
Fellows Gear Shaper Co., The.....	69	Standard Gage Co., Inc.....	92
Ferner Co., The R. Y.....	53	Starrett Company, The L. S.....	100
Formica Insulation Company, The.....	73	Strand & Company, N. A.....	95
Fosdick Machine Tool Company, The.....	23	Stuart & Company, Inc., D. A.....	103
Footte Bros. Gear & Machine Co.....	15	Stur Oil Co.....	46, 47
Gallmeyer & Livingston Co.....	87	Sundstrand Machine Tool Co.....	109
Genesee Manufacturing Co., The.....	83	Swedish Gage Company of America.....	85
Graham Mfg. Co., The.....	101		
Greaves-Klusman Tool Company.....	88	Tomkins-Johnson Co., The.....	96
Grobet File Corporation of America.....	105		
		Union Manufacturing Company.....	81
Hamilton Mfg. Co.....	17	United States Drill Head Co., The.....	84
Haskins Co., R. G.....	90	United States Electrical Tool Co., Fourth Cover	
Heuser Manufacturing Company.....	113		
Hisey-Wolf Machine Co., The.....	1	Waltham Machine Works.....	109
Horsburgh & Scott Co., The.....	107	Waterston's	105
Hough, Thos. R.	80	Wedge-Lock Tool Company.....	93
Hutto Eng. Co., Inc.....	21	Western Screw Products Company.....	57
		Western Tool & Mfg. Co., The.....	107
Independent Pneumatic Tool Company.....	41	Wetmore Reamer Co.....	37
Index Machinery Corp.....	35	Whirlwind Products Co.....	79
		Whiton Machine Co., The D. E.....	82
Kearney & Trecker Corporation.....	3	Williams & Co., J. H.....	33
Koebel-Wagner Diamond Corp.....	99	Wilson-Maeulen Co., Inc.....	55
Koza, Charles A.....	85		

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WHEN you want a keyway cutter that will give you better results ... increase your production ... and save you money ... consider these three MIDWEST points of superiority:

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The cutter is inserted in the holder and securely locked in place with a set screw. This feature eliminates any chance of the cutter slipping in or out of the holder.

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Supporting the cutter with the overhanging arm eliminates end play. Thus the cutter runs true, and chances of breakage are slight.

3. Driven By "Midwest Pin Drive"

The "MIDWEST PIN DRIVE" is positive. There is no chance of the cutter slipping around while cutting.

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Midwest Tool & Mfg. Co.

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Detroit, Michigan

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Not as good as CLE-FORGE. Requires more frequent sharpening.

DRILL NO. 2.

Do not stand up in bronze and brass. Not as hard as CLE-FORGE.

DRILL NO. 3.

Tried on cushion sprocket, but did not stand up well. Cut about 1/3 more pieces with CLE-FORGE drills.

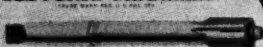
DRILL NO. 4.

Not as good as Cleveland drills. Require more frequent sharpening and break easily.

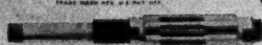
DRILL NO. 5.

Used on aluminum. They plug up with chips more than CLE-FORGE drills on account of their twist.

CLE-FORGE HIGH SPEED DRILLS



PEERLESS REAMERS



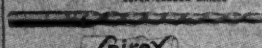
Quick Set



EZY-OUT



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SpireX



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BONNEY

**CV (Chrome-Vanadium)*

WRENCH SETS

No. 28	Double End Set	\$21.00
No. 18	Ignition Wrench Set	9.82
No. 20	Miniature Wrench Set	3.46
No. W	Single Hexagon Socket Wrench Set	20.00
No. WD	Double Hexagon Socket Wrench Set	21.50
No. 35	Brake Adjusting Wrench Set	12.50
No. 412	Trapper Wrench Set	14.50
No. R	Single Hexagon Socket Wrench Set	20.48
No. RD	Double Hexagon Socket Wrench Set	20.65
No. 25	Heavy Duty Socket Wrench Set	24.75
No. TD	Miniature Double Hexagon Socket Wrench Set	8.25
No. 34	Double End Box Wrench Set	25.00
No. 26	Double End Box Wrench Set (short type wrenches)	9.50
No. 34	Double End Box Wrench Set	12.10
No. O	11 Double Hexagon Sockets	8.60
No. D	8 Double Hexagon Sockets	6.40
No. 4	Single Set of Right Angle Wrenches	2.75
No. 5	Single Set of Engineer's Wrenches	1.70
No. 40	General Utility Set of Right Angle Wrenches	6.50
No. 25	General Utility Set of Engineer's Wrenches	8.65

Prices include containers, as shown.

Excluding Sockets

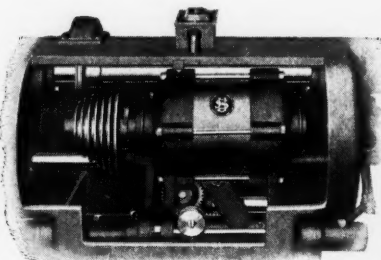
Excluding Sockets

BONNEY FORGE & TOOL WORKS
ALLENTOWN, PA.

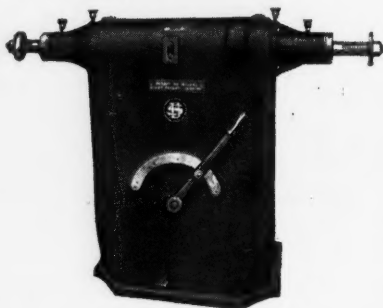
Makers of Special Service Wrenches of Chrome Vanadium,
Carbon Steel Drop Forged Wrenches, Pipe Wrenches, Vises
and Drop Forgings and the Bonney Rim Tool,
Patents Pending



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